COMMERCIAL FISHERIES ABSTRACTS

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FISH TECHNOLOGY EXPERIMENT STATION,
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U.S. DEPARTMENT OF THE INTERIOR
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0.117 COUNTERCURRENT EXTRACTION OF RAW COTTONSEED FLAKES WITH THE ACETONE-HEXANE-WATER AZEOTROPE

Frampton, Vernon L., Armand B. Pepperman, Jr., Joseph Simmons, and W. H. King (Southern Regional Research Laboratory, New Orleans, Louisiana)
Journal of Agricultural and Food Chemistry 15, No. 5, 790-797 (September-October 1967)

Cottonseed meals of high nutritional quality have high levels of available lysine and low levels of gossypol, gossypol derivatives, and residual crude oil. Conventional cooking methods of extracting the oil from cottonseed flakes destroys a part of the lysine and causes part of it to be bound in the meal in a manner that makes it unavailable to nonruminants that eat the meal. Cooking also causes the gossypol to be bound in the meal and a residuum of crude oil to be left there.

A stepwise, countercurrent extraction process in which the acetone-hexane-water azeotrope (b. 49° C., flash point -20° C.) is the solvent is suggested as a means of eliminating the cooking. During a test of the 3-, 4-, 5- and 10-step processes (with 3^2, 4^2, 5^2, or 10^2 extractions, respectively), fresh cottonseed, soybean, and 1:1 cottonseed-soybean flakes were made to flow one way, in contact with oil-rich miscella (solutions or mixtures containing extracted oil), while the spent flakes flowed the other, in contact with fresh solvent. Miscellas were separated from marcs (the insoluble residue left after the oil is extracted) either by centrifugation or through a vibrating screen.

(over)

 ABSTRACTER: L. Baldwin

0.34 ESTERS FROM THE REACTION OF ALKYL HALIDES AND SALTS OF CARBOXYLIC ACIDS

Hennis, Henry E., James P. Easterly, Jr., L. R. Collins, and Leonard R. Thompson (Benzene Research Laboratory, The Dow Chemical Company, Midland, Michigan)
Industrial and Engineering Chemistry, Product Research and Development 6, No. 3, 193-195 (September 1967)

The preparation of esters from the reactions of alkyl chlorides and sodium salts of carboxylic acids could be important if a suitable solvent could be found for the extremely incompatible alkyl chloride and sodium salt. If the right catalysts and conditions could be found, reactions having fairly high yields might be possible. The most comprehensive study in this area was performed by Yamashita and Shimamura (1957) who pointed out that the reaction of cetyl chloride and sodium acetate gave a 92.8 percent yield in the presence of pyridine and sodium iodide. These authors, however, ignored chloride ion liberation from the reaction of the amine catalysts and reactions of alkyl halides with amines. Therefore, the authors began a reinvestigation with more reliable analytical techniques and with a larger variety of starting materials in an effort to broaden the scope of the reaction. Various combinations of methyl, n-butyl, allyl, and benzyl chlorides with sodium acetate or propionate, benzoate, and salicylate were reacted to form esters.

The authors established that triethylamine was an effective catalyst and that sodium iodide was often helpful. Methyl ethyl ketone solvent was chosen as the

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 ABSTRACTER: M. F. Tripple

0.33 THE ORIGIN AND QUANTITATIVE DISTRIBUTION OF SUGARS AND SUGAR PHOSPHATES IN FISH MUSCLES POST MORTEM AND THE ROLE OF THESE IN MAILLARD BROWNING

Tarr, H. L. A. (Fisheries Research Board of Canada, Vancouver Laboratory, Vancouver, British Columbia)
Food Science and Technology, Proceedings of the First International Congress of Food Science and Technology, London, September 18-21, 1962, Biological and Microbiological Aspects of Foods 2, pp. 197-202 (Gordon and Breach Science Publishers, New York [1965])

Burt (1961) found that the level of muscle of glucose remained at a fairly constant concentration of about 110 micromoles per 100 grams until the eighth day of storage; after 20 days, the glucose level fell to zero because of bacterial action. The glucose 6-phosphate rose only slightly during the first 2 days and then fell sharply to a very low value after about 4 days. With aquarium cod, the initial level of glucose first fell significantly and then rose to a much higher level after 4 or 5 days of storage; and after 10 days, the level fell to almost zero. Other results indicate that glucose 6-phosphate rises to almost four times its initial level after 5 days of storage and then falls to a low level after 10 days. A marked rise of fructose monophosphate(s) to almost four times the initial level was noted after about 3 days of storage. In recent experiments, the concentration of ribose 1-phosphate initially rose to about 5 micromoles per 100 g., fell to about 1 micromole per 100 g., rose again to almost 10 micromoles per 100 g. after about 6 days, and then fell slowly. The purpose of the present

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 ABSTRACTER: M. F. Tripple

0.5 CHARACTERISTICS OF CLOSTRIDIUM BOTULINUM TYPE F ISOLATED FROM THE PACIFIC COAST OF THE UNITED STATES

Eklund, M. W., F. T. Poysky, and D. I. Wieler (Bureau of Commercial Fisheries Technological Laboratory, Seattle, Washington 98102)
Applied Microbiology 15, No. 6, 1316-1323 (November 1967)

The two objectives of this investigation were (1) to determine the physiological and biochemical characteristics of the strain of Clostridium botulinum Type F recently isolated from the Pacific coast of the United States, and (2) to determine whether the characteristics of the isolate differ from those of the prototype Langeland strain.

The recent isolates of C. botulinum Type F were nonproteolytic, fermented sucrose and ribose, produced spores of low thermal resistance, produced a protoxin activated by trypsin, and grew and produced toxin at 38° F. from a spore inoculum. In comparison, the prototype Langeland strain was proteolytic, did not ferment sucrose or ribose, the toxin of 3-day-old cultures was not activated by trypsin, and produced spores of relatively high thermal resistance.

About two to three times the minimum lethal dose (MLD) of Type F toxin from both Langeland strain and the nonproteolytic isolate was cross neutralized by 1,000 anti-MLD of Type F antitoxin. Antitoxin serums prepared by immunizing rabbits with the toxoid of the nonproteolytic Type F isolate neutralized the toxin

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 ABSTRACTER: M. F. Tripple

COUNTERCURRENT EXTRACTION OF SEED FLAKES

ROLE OF SUGARS AND SUGAR PHOSPHATES IN MAILLARD BROWNING

REACTION OF PRIMARY ALKYL CHLORIDES AND SODIUM SALTS

CHARACTERISTICS OF CLOSTRIDIUM BOTULINUM TYPE F

0.33

work was to determine as accurately as possible the origin of these various sugars or sugar phosphates in fish muscle.

The fish examined included sockeye salmon (Oncorhynchus nerka), rainbow trout (Salmo gairdneri), halibut (Hippoglossus stenolepsis), Atlantic cod (Gadus callarias), and lingcod (Ophiodon elongatus).

Intravenous injection of uniformly labeled glucose C^{14} or of glucose 6-phosphate C_1C^{14} into the fish resulted in prompt labeling of intermediates of the Embden-Meyerhof glycolytic pathway, such as the fructose phosphates and lactate. Introduction of the C^{14} glycogen from salmon muscle into lingcod muscle stored at 0° resulted in the formation of radioactive glucose, maltose, and glucose 6-phosphate. Because the glucose 6-phosphate was only feebly degraded to glucose by fish muscles, the author concluded that almost all the glucose was formed as a result of amylolytic action. Ribose and ribose 5-phosphate were only found in muscle held at 0° post mortem; since these sugars were not radioactive, it appeared that they did not arise via the oxidative pentose cycle (hexosemonophosphate shunt). Introduction of uniformly labeled adenosinetriphosphate C^{14} into the fish muscle resulted in the formation of radioactive nucleotides and ribose during storage at 0°. The accumulated data indicated that all pentose and pentose phosphate in the fish muscles were formed from nucleotides such as adenosinetriphosphate. The fructose monophosphate that was prepared as a lithium salt from the muscle of Atlantic cod and Pacific salmon was shown to consist almost entirely of the 6-ester. No ribose 1-phosphate was found in the various fish muscles studied.

The author concludes that each species of fish must be studied separately as great differences exist among species. [17 references]

0.117 (Cross Reference: 6.13)

Results of the tests show that marcs can be put through the whole extraction process in 3 min. or less. Even the three-step procedure will reduce the oil level of the finished meal to less than 0.5 percent. The oils recovered are said to be of excellent quality, readily amenable to refining and bleaching by conventional methods. Moreover, the yield is higher than from the conventional method. When the oil is extracted at room temperature (where the flakes' exposure to the solvent needs span only a few minutes) and the solvent is distilled in glass equipment, the resulting meal has no off-flavors. It does have a high level of available lysine and low levels of gossypol and residual crude oil.

The relation between the oil content of the marcs and the time that the fresh flakes were exposed to the azeotrope led to the conclusion that the extraction processes follow the dilution law. The following formulas were a consequence of this conclusion:

(1) $\log L = 1.45 - 0.094P$
where L is the oil content of any marc obtained at step P.

(2) $\text{Log } G = 0.075 - 0.057P$
where G is the gossypol content of any marc obtained at step P.

(3) $\log L = d - P[lr + k \log F]$
where L is the oil content of a marc at step P obtained with a solvent-to-flakes ratio of r when the marc and the miscella are separated at centrifugal force F; d, l, and k are constants (estimated by the method of least squares). [12 references]

0.5

of the Langeland strain; however, the serum did not show cross neutralization with the toxins of other types of C. botulinum.

The data indicate that the nonproteolytic Type F isolate and Langeland Type F strain differ considerably in the following characteristics: (1) saccharolytic and proteolytic activity, (2) production of hydrogen sulfide, (3) thermal resistance of spores, and (4) activation of toxin by trypsin. Other authors, however, have reported that 90 percent of the potential toxin of young cultures of the Langeland strain existed in the form of the precursor and that with the older cultures the greater portion of the precursor usually had been converted to toxin.

The biochemical and physiological characteristics of the nonproteolytic strains of Types B, E, and F isolated from samples collected from the Pacific coast are indistinguishable. The nonproteolytic strains of these types have the following characteristics: (1) produce toxin activated by trypsin, (2) produce spores of low thermal resistance, (3) grow and produce toxin at low temperatures, and (4) all possess the same biochemical, cultural, and colonial characteristics. With these recent findings on Type F, both nonproteolytic and proteolytic strains of C. botulinum Types B and F are now known to exist. In a recent study on the incidence of C. botulinum in marine sediments, one of the enrichment cultures yielded Type A botulinum toxin that was lethal to mice only after trypsin activation. This culture has not been separated into pure culture; however, because of the necessity for trypsin activation to detect toxicity, the possibility does exist that it is a strain of nonproteolytic Type A. [18 references]

0.34

solvent because low molecular weight ketones favorably shift the equilibrium of the reaction to give the more reactive alkyl iodide. Once the reaction started, the ester was in excess of the ketone and served as a solvent that was as effective as methyl ethyl ketone. Five grams each of triethylamine and sodium iodide were sufficient to give good yields of ester in a reasonable length of time.

A series of experiments was conducted to find optimum temperatures for each system. The reactions were then repeated at their optimum reaction temperatures in the presence of only one catalyst at a time to determine the effectiveness of triethylamine and sodium iodide alone and in the absence of any catalyst. Triethyl amine was a necessary catalyst in every system; yields were negligible without it, even in the presence of sodium iodide. The authors inferred that triethylamine would be a necessary catalyst in the reaction of an alkyl iodide with a sodium salt of a carboxylic acid under these conditions. Use of sodium iodide and triethylamine together increased good yields of methyl esters. Sodium iodide was an extremely helpful catalyst in reactions where relatively unreactive alkyl chlorides were involved; it was generally of no use in the reactions of allyl and benzyl chloride. The exception to this generalization was the allyl chloride-sodium salicylcate system where the use of sodium iodide increased the yield from 15 percent to 87 percent. Good yields were obtained at reaction temperatures of 75° to 175° C. and reaction times of 2 hours or less. The authors make the final point that the effects of sodium iodide and triethylamine are not additive, and there appears to be an interplay of the two catalysts. [14 references]

1.11 EFFECTS OF LIGHT ON SCHOOLING AND FEEDING OF JACK MACKEREL, TRACHURUS SYMMETRICUS

Hunter, John R. (U.S. Bureau of Commercial Fisheries, Fishery-Oceanography Center, La Jolla, California)
Journal of the Fisheries Research Board of Canada 25, No. 2, 393-407 (February 1968)

The author relates the schooling behavior of juvenile jack mackerel (Trachurus symmetricus Ayres) to the photometric brightness or luminance in an experimental tank. He also includes data on the effect of different levels of luminance on feeding behavior to provide additional information on the relation between light and the behavior of jack mackerel. The room, tank, and light sources were designed to provide a diffuse illumination and a field of uniform luminance in an effort to avoid as many photometric errors as possible. The behavior of the jack mackerel was studied in relation to luminance or photometric brightness in the tank, rather than to illuminance or light intensity. The luminance of the surface was measured in food-Lamberts (ft-L), which is equal to the product of its luminous directional reflectance multiplied by illuminance in food-candles. Luminance in the tank was changed without altering the spectral composition of the light.

Each school of six jack mackerel was photographed with infrared film at eight different levels of luminance and also in darkness. Three indices were
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 ABSTRACTER: M. F. Tripple

1.120 (*) "DAIEN STEAK," "CONVENIENCE" TYPE TUNA PRODUCT PRODUCED AND PACKAGED AT SEA

Sakai, Kenji
Ocean Fisheries 4, No. 1, 14-15 (January 1968)

A raw-frozen packaged tuna product is currently being used in the important Japanese sashimi and sushi market, which uses enormous quantities of tuna. The tuna product is actually a steak that is designed to offer a number of modern technique and convenience-food attractions to the ancient, but highly sophisticated and exacting, trade of supplying the Japanese with tuna to be eaten raw with cold rice (as sushi is) or sliced and eaten with soy sauce and horseradish (as sashimi is). For these uses, the tuna must be quite fresh, and the steaks are designed to provide this quality. The steaks are also convenient for the housewife, the fish retailers, and the speciality restaurants where much of the sushi and sashimi are served.

The boats longlining for tuna in the Indian Ocean or in the vicinity of New Zealand and Tasmania are specially equipped to process the fish as soon as it is landed. The fish is dressed to yield clear loins, with all the dark meat, skin, and bones removed. The solid loins are cut into single 28 × 8 × 4 centimeter pieces weighing either 2.2 or 1.1 pounds. The steaks are vacuum packed in polyethylene bags, sealed, sharp frozen at -45° C., and stored at -35° C. The onboard dressing of the compact finished product greatly increases the economic
*Item on back of card. (over)

 ABSTRACTER: M. F. Tripple

2.01 EFFECT OF LIPID MATERIALS ON HEAT RESISTANCE OF BACTERIAL SPORES

Molin, N., and B. G. Snygg (Swedish Institute for Food Preservation Research (SIK), Göteborg, Sweden)
Applied Microbiology 15, No. 6, 1422-1426 (November 1967)

Spores suspended in lipid materials are usually more resistant to heat than are spores suspended in water systems. It is claimed that the heat resistance of spores in fats approaches their resistance to dry heat or even exceeds it. There is also some evidence that spores or vegetative cells suspended in the lipid phase might survive exposure to the temperatures used in the heat sterilization of foods. Under certain circumstances, such as the heavy agitation of food samples, the spores might migrate out of the lipid and after incubation cause spoilage.

Little is known, however, about the underlying principles of fat protection, the distribution of the spores between lipid and water phase, and the significance of fat-protected spores in heat-sterilized foodstuffs. This investigation, the first of a series dealing with these problems, is concerned with the degree of fat protection of certain Clostridium and Bacillus spores suspended in heated soybean oil, olive oil, triolein, and liquid paraffin.

The apparent heat resistance of spores of Bacillus megaterium, B. subtilis, B. cereus, B. stearothermophilus, and Clostridium botulinum Type E in lipids was compared with the resistance of the same spores in phosphate buffer solution. The
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 ABSTRACTER: M. F. Tripple

2.01 (*) PROTEOLYTIC ACTIVITY OF MICROORGANISMS ISOLATED FROM FRESHWATER FISH

Kazanas, Nuria (U.S. Bureau of Commercial Fisheries Technological Laboratory, Ann Arbor, Michigan 48107)
Applied Microbiology 16, No. 1, 128-132 (January 1968)

Microorganisms that grow at low temperatures and show proteolytic activity have been assumed to be the primary cause of fish spoilage. The conventional method of determining the proteolytic activity of such microorganisms is by use of skim milk, gelatin hydrolysis, or both. For a better evaluation of the proteolytic activity of microorganisms isolated from both fresh and spoiling fish, a fish substrate that simulates the natural composition of fresh, raw fish is desirable. It became necessary to develop a fish substrate that would be routinely available and easily sterilized. To simulate natural conditions and to preserve the native state of labile constituents as much as possible, cold sterilization was used as the method. Although filtration sterilization, would also achieve cold sterilization, the various manipulative difficulties that would be involved in filtering fish juice removed filtration sterilization from consideration.

The author undertook the present study to develop a medium, to evaluate its suitability for testing proteolytic activity of bacteria isolated from fish, and to report at a later date on the incidence of proteolytic organisms in fresh and spoiling irradiated and nonirradiated fish.
*Items on back of card. (over)

 ABSTRACTER: M. F. Tripple

EFFECTS OF LIGHT ON SCHOOLING BEHAVIOR OF JACK MACKEREL

CONVENIENCE TYPE OF TUNA PRODUCT

HEAT RESISTANCE OF BACTERIAL SPORES IN LIPIDS

PROTEOLYTIC ACTIVITIES OF MICROORGANISMS FROM FISH

1.120

capacity of the fishing vessel. Immediate refrigeration at low temperature preserves the freshness and color of the steak. When the steaks are to be prepared for sushi or sashimi, they are partially thawed to the point where they can be cut into portions with a sharp knife. The portions are maintained near the freezing point until served.

The reception of the steaks was so enthusiastic that six 400-ton longliners built in 1967 in Japan were equipped with the special processing facilities and the extra freezing and low-temperature storage capacity demanded by the quality control specifications of the new product. Bluefin tuna are the most highly esteemed fish for sushi and sashimi, followed by bigeye and yellowfin tuna. Albacore, skipjack, and some marlins are not as highly regarded, although these fish are sometimes used. Locally caught bluefin often command incredibly high prices in the Japanese markets. Southern bluefin, taken south of Australia and around New Zealand, also command top prices in Japan.

1.120 THE ATLANTIC TUNA FISHERIES, 1963

Shomura, Richard S. (U.S. Department of the Interior, Bureau of Commercial Fisheries Biological Laboratory, Honolulu, Hawaii)
Commercial Fisheries Review 28, 1-11 (May 1966)

This report summarizes the recent growth in landings of commercially important tuna species in the Atlantic, describes the statistics on landings and the fishing methods used in the various tuna fisheries, and attempts to assess the magnitude of the Atlantic tuna resources by comparing the Atlantic landings with Pacific landings. [19 references.] [Abstracter: M. F. Tripple]

2.01

A raw fish juice was prepared from whole yellow perch, sterilized with ^{60}Co γ-irradiation, and placed in an agar medium. Both this medium and a skim milk-agar medium were used to test the proteolytic activity of 1,145 bacterial isolates from nonirradiated and irradiated (0.3 and 0.6 Mrad) yellow perch fillets held at various incubation temperatures. Most isolates that showed proteolytic activity did so in both media; a few isolates showed proteolytic activity only in one medium. Proteolysis was found mainly among the bacteria isolated from the fresh perch fillets. Nonproteolytic organisms were slightly more abundant than were the proteolytic organisms throughout the 6 days of refrigerated storage, as the proteolytic organisms constituted 48 percent of the total organisms. Irradiation eliminated essentially all the proteolytic bacteria in the fillets stored at 1° C. However, some proteolytic bacteria survived for a few days after irradiation when the fillets were stored at 5° C. [10 references]

2.00 FISH SPOILAGE.
BIOCHEMICAL AND BACTERIOLOGICAL TRANSFORMATIONS
IN FISH TISSUES -- THEIR TECHNOLOGICAL SIGNIFICANCE

Slack, E. B. (Victoria Univ., Wellington, New Zealand)
Chemical Abstracts 68, No. 7, 28558r (February 12, 1968)

2.01 ROLE OF THE HAFNIA BACTERIA IN THE RISE OF HISTAMINE
IN TUNA FISH MEAT

Havelka, B. (Ustredny Statny Vet. Ustav, Bratislava, Czechoslovakia)
Chemical Abstracts 68, No. 5, 21019g (January 29, 1968)

1.11

used to measure the behavior of the school from the motion-picture film. Two of the indices--mean distance to nearest neighbor and mean separation distance--were measures of the distances between individuals in a school. The other index--mean angular deviation--was a measure of differences in orientation between individuals. A value for each index was calculated for each frame of the motion-picture film.

No differences existed in the angular deviation of the school or the distances between the fish when the luminance was from 12.1 to 6×10^{-6} ft-L. At 6×10^{-6} ft-L, the intervals between individual fish were much larger than at higher levels of brightness; groups showed little uniformity in their orientation. Below 6×10^{-7} ft-L, which was darkness, the schools were dispersed and the values of angular deviation were randomly distributed.

The ability of jack mackerel to feed on live adult shrimp (Artemia) was also tested at eight levels of luminance and in darkness. About half as many shrimp were eaten at 6×10^{-5} ft-L as were eaten at a normal daytime level of luminance of 12.1 ft-L. Few shrimp were eaten at 6×10^{-7} ft-L, and no shrimp were eaten in darkness.

Comparison of the data obtained with measurements of light in the sea indicate that jack mackerel would probably be able to maintain schools near the surface on a moonless, starlit night and that they probably could feed effectively near the surface on a full moonlight night. [21 references]

2.01

most pronounced increase in heat resistance was noted for B. subtilis and C. botulinum Type E; the increase varied with the type of lipid used. When the lipids used as the heating menstruum had a high water content, the heat resistance of the spores was lowered.

The sporulation conditions and the conditions under which heated spores were recovered were standardized in this investigation. This standardization allowed the effect of varying the heating menstruum on the survival of the spores to be estimated. In a moist environment, the thermophilic spores of B. stearothermophilus and B. coagulans were more heat resistant than the spores of most mesophilic organisms were. In a dry environment, the order of heat resistance of at least some of the Bacillus spores was different. Other investigators have found the spores of B. subtilis var. niger to be much more heat resistant to dry heat than were B. stearothermophilus spores. That the heat resistance of various types of bacterial spores varies with the relative humidity of the atmosphere has also been previously demonstrated.

The fat protection has been attributed to poor heat conductivity in lipids. The differences in the heat resistance of the buffer and the lipids in the present investigation, however, are hardly due to the lower heat conductivity of the lipids; rather they are, to a certain extent, the protecting effect that seems to correlate with the water content of the lipids. Lipids saturated with water, however, still have a high capacity to protect spores against heat. The results suggest that the high resistance of spores in lipids is not due entirely to the water-free environment. This is stressed by the fact that the protective effect varied in various lipids with the same water content. [22 references]

2.05 (*) INITIAL EVALUATION OF THE EFFECT OF BUTYLATED HYDROXYTOLUENE UPON SALMONELLA SENFTENBERG 775W

Ward, Michael S. (Pascagoula Junior High School, Pascagoula, Mississippi), and B. W. Ward (Institute of Marine Sciences, University of Miami, Florida 33149)
Poultry Science 46, No. 6, 1601-1603 (November 1967)

Freshly produced fish meals are usually free of Salmonella, but subsequent contamination is a possibility, and fish meal has been found to harbor Salmonella. Because fish meal is routinely added to many feeds, the possible presence of Salmonella is of concern to public health and animal health authorities.

Concentrations of up to 0.0375 percent of butylated hydroxytoluene (BHT) are often added to commercial fish meals in an effort to minimize the oxidation of residual oils. The authors felt that the effect of BHT on the growth or survival of Salmonella merited study. If BHT was found to be effective, the routine addition of this antioxidant to fish meal might offer protection against the possible presence of Salmonella.

Ten plates each of three agars were inoculated with 1.0 milliliter of a culture suspension of Salmonella senftenberg. Two inoculated plates of each medium were overlaid with a sterile agar that contained either 0.01, 0.0375, 0.1, or 1.0 percent of BHT. The plates were examined after 24 hr. of incubation at 35° C.

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 ABSTRACTER: M. F. Tripple

2.115 (*) THE RELATIVE IMPORTANCE OF TRAWLER DESIGN IN THE ECONOMICS OF FISHERY OPERATIONS

Doust, D. J.
J. Brit. Ship Res. Ass. 20, No. 9, Abstract No. 23,507, p. 567 (1965)
World Fisheries Abstracts 17, No. 1, 11-12 (January-March 1966)

The optimum hydrodynamic performance of a trawler can usually be estimated if its speed, length, and displacement are specified. However, the most hydrodynamically efficient trawler is not necessarily the most economically efficient one--too many interrelated factors must be taken into account. Up to now, insufficient quantitative data have been accumulated to permit reliable estimates of the best overall efficiency of fishing operations to be made. Even when attempts have been made to determine the design parameters required to provide the maximum economic return, insufficient use of computers has hampered the efforts.

The author emphasizes the part that computers must play once more data have been obtained from analyses of operational results. On the assumption that these data will be available, he shows in some detail how they can be used as a basis for the computer program. The large number of variables that must be taken into account include the primary characteristics of the vessel--such as hull dimensions and displacement, machinery type, engine power and weight, and fuel- and fish-storage capacity; the secondary characteristics of the vessel--such as stability, seaworthiness, sustained speed, and catching ability; the characteristics of the

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 ABSTRACTER: L. Baldwin

2.113 ZINC ANODES SAVE CRABBERS CASH

Anonymous
National Fisherman 48, No. 10, 18B (December 1967)

Although rough handling and mechanical damage causes harm to crab pots, corrosion causes more. In Virginia waters, for example, three or four sets of pots are needed each season because of loss by corrosion. To remedy this situation; the International Lead Zinc Research Organization (ILZRO) began a program in 1959 that has more than tripled the service life of crab pots.

The protective device that resulted from the program is a 1.75-pound anode made of high grade zinc. It is about 7.5 inches long and 1 inch thick. Embedded in this anode is a galvanized iron wire that is used to attach the device to the pot. When the pot is immersed in salt water, the zinc anode begins to deteriorate first, for zinc is a more active metal than is the steel from which the pot is made. As long as any of the anode remains, the pot is protected from corrosion--the expensive steel pot is protected by the cheaper zinc bar.

To test the effectiveness of these anodes, ILZRO attached them to some new pots and placed these test pots, along with some unprotected pots, at the mouth of the York River (Virginia), 11 miles upstream, and 19 miles upstream. The water ranged in depth from 3 to 30 feet.

(over)

 ABSTRACTER: L. Baldwin

2.12 DECK EQUIPMENT LAYOUT ON M/V DELAWARE FOR SURF CLAM SURVEY

Fahlen, Lars A. (Bureau of Commercial Fisheries, Exploratory Fishing and Gear Research Base, Gloucester, Massachusetts 01930)
Commercial Fisheries Review 29, No. 10, 87-89 (October 1967)

To evaluate the availability and abundance of surf clams, the Bureau of Commercial Fisheries' exploratory fishing vessel Delaware was especially rigged for a survey of surf clams off New Jersey, Maryland, and Virginia. The equipment on the Delaware differed from that of a commercial clam boat because she was longer and because heavier gear was needed for the survey. This paper describes the rigging as a reference for future research cruises and for possible application to large commercial vessels.

As a basic support for handling the dredge gear, the Delaware was fitted with a 16-foot 7-inch long piece of 16-inch I-beam secured to welded brackets on the foremast. The I-beam extended horizontally and athwartship from the mast to about 2 ft. beyond the rail. The outboard end of the beam had a 9-ft. 7-in. long support of 6-in. steel pipe that was stepped on the deck. For additional support, a 3/4-in. steel cable secured under the crosstree was attached at the outboard end of the I-beam. At the beam's outer end, a swivel hanging bollard was installed for a 1-in. haulback cable, which was shackled to the forward end of the dredge on the crossbar between the runners. The cable extended through the hanging bollard and two deck bollards to the port drum of the main trawl winch.

(over)

 ABSTRACTER: M. F. Tripple

2.113 (Cross Reference: 2.1128)

The protected pots at the mouth of the river showed no signs of corrosion after 24 weeks of use, although the anodes were reduced to pencil size; the unprotected pots were completely deteriorated after 20 weeks. The protected pots that had been set 11 miles upstream were still in good condition at the end of the season; one of the unprotected pots had to be discarded after only 15 weeks' use. Unprotected pots set 19 miles upstream were completely corroded after 9 weeks; after 17 weeks, the wire in the protected pots was intact, although some of the anodes had completely disappeared.

All the tests proved that zinc anodes are completely effective in preventing corrosion of the crab pot. Evidently the depth of the water and the degree of salinity does not alter the effectiveness. The anodes did not interfere in any way with the operation of the pot. Catches in the anode-protected pots and the unprotected pots during this test were virtually equal. Thus, for the investment of about 75 cents an anode, a fisherman may save from $3 to $5 a pot. In addition to the direct cost of wiring, he avoids the indirect cost of maintaining a large inventory of replacement pots and of having to spend time during his busiest season in the rewiring job itself. The author estimates that a commercial crabber who sets 200 pots will save from $600 to $1,000 per season by using zinc anodes.

2.12 (Cross Reference: 1.82)

The hoisting boom for taking the dredge aboard was 31 ft. 9 in. long and made of heavy-duty 8-in. steel pipe. The boom was fitted with a swiveling gooseneck at the bottom end. The boom was stepped on a base laid horizontal to and but 6 in. above the deck, between the two forward deck fairlead bollards. In the center of the base, a hole was drilled through both pieces of steel; the gooseneck was inserted through both holes and pinned below the bottom piece. This method allowed the boom to swivel in all directions. Each end of the base for the boom was welded to the steel base of the deck fairlead bollards.

When the dredge was hauled to the hanging bollard at the end of the I-beam, a luff-rigged lifting tackle from the top of the boom was hooked into three straps of welded chain permanently attached to the dredge. The forward strap was 5 ft. long and was shackled into the towing bar of the dredge; the other two straps were 4 ft. long and were secured to the forward part of the after cage. All three straps were shackled into an 8-in. lifting ring. The topping lift for the boom was used to bring the entire dredge across the vessel's bulwark. The 48-in. dredge alone weighed about 3,000 lb.; a full load of clams and bottom sediment added an additional 6,000 lb.

A bow-towing position was used to tow the dredge with the shortest length of jet hose. To implement towing from this position, a 48-ft. long piece of 4-in. steel pipe was welded to the outside of the bow and the forward part of the keel. The adjustable towing cable passed through the pipe down to the dredge. The dredge was towed beneath the vessel, rather than behind it. The dredge was brought aboard the vessel in the same manner whether towed conventionally or by using the bow hawser pipes.

2.05

The effects of BHT on cultures of S. senftenberg appeared to be only slightly inhibitory. To inhibit S. senftenberg beyond 24 hr. would require the impractically high concentration of at least 1.0 percent BHT. It was the conclusion of the authors that control of Salmonella in fish meals by addition of BHT is of little practical value.

2.115

fishing ground--such as its productivity, the distribution of species there, and its distance from various fishing ports; the characteristics of the port of landing--such as the unloading and handling facilities, depth of the water, and distance from inland markets; and numerous economic items relative to receipts and expenditures. A factor that must not be forgotten is that white fish, even when properly cleaned, washed, and packed in ice, will start to deteriorate after about 15 days and must, therefore, be landed before then if it is to be fit for human consumption. The "catching ability" of the skipper is another factor that should be taken into account.

In his concluding remarks, the author draws attention to the dangers of designing wet-fish vessels without adequate regard for economic considerations or without sufficient operational data. He cites an instance in which smaller, cheaper vessels were out-fishing larger vessels on the same fishing grounds.

2.1475 MATERIAL HANDLING ON WEST COAST TRAWLERS AND SEINERS

Allen, Robert F. (Marine Construction and Design Co., Seattle, Washington)
Western Fisheries 75, No. 3, 24-26, 28-29, 40-41 (December 1967)

The author establishes as a realistic goal the design of a purse seine vessel that (1) is manned by the minimum crew required for steaming, (2) does not require an auxiliary boat, (3) is equipped with net-setting and hauling equipment, (4) requires no additional manpower, (5) does not require physical labor to pump the fish aboard, and (6) can discharge itself without shoreside assistance.

The size of the crew on a typical herring seiner is determined by the net-handling requirements while hauling the large purse seine. The introduction of the Puretic power block has resulted in a 10 to 15 percent reduction in the number of crew. If a seine drum is used, a five-man crew can do the work of the six or seven men required with the power-block system. However, other phases of the fishing operation still require full manpower.

Concentrating the fish in the bunt end of the net takes time and effort. The author feels that the use of electricity to concentrate the fish in the net warrants further attention because such a system would enable a minimum crew to handle large catches.

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3.19 TEAMS MICROWAVES WITH STEAM
(*)

Anonymous
Food Engineering 39, No. 11, 72-73 (November 1967)

A continuous microwave cooking system has been installed in a poultry processing plant that cooks and then freezes up to 3,000 pounds per hour of cut-up chicken pieces. With a two-shift operation, the processing cost is estimated at 7/8 cent per pound. Microwave and steam cooking are combined so that cooking is continuous and the surface and interior of chicken parts are uniformly cooked. With microwave cooking alone, interior portions were fully cooked but exterior portions were incompletely cooked. The use of two microwave steam ovens allows various sizes of chicken parts to have different cooking temperatures under similar cooking times. Legs and wings require less cooking and are conveyed through a low-powered oven; breasts and thighs need more cooking and are processed in a high-powered unit. The system also has the ability to convey microwave-cooked poultry pieces from the chiller through battering-breading machines and then through a freezer. Alternately, cooked pieces are conveyed from the battering-breading station through a deep-fat fryer, second chiller, and freezer. This flexibility results in either "brown-n-serve" or "heat-n-eat", precooked, breaded, frozen chicken parts.

About 300 feet of conveyors--through cooking, chilling, breading, frying, chilling, and freezing to packaging--makes the system continuous. Cooking is done

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2.9 SAXITOXIN AND TETRODOTOXIN:
COMPARISON OF NERVE CLOCKING MECHANISM

Narahashi, Toshio, Hans G. Haas, and Edward F. Therrien (Department of Physiology, Duke University Medical Center, Durham, North Carolina 27706)
Science 157, No. 3795, 1441-1442 (September 22, 1967)

Saxitoxin (STX) is the active ingredient in the poison isolated from toxic Alaska butter clams (Saxidomus giganteus). There is evidence that the chemical structure of STX is somewhat different from that of tetrodotoxin (TTX). It is known that TTX blocks nerve excitation by specifically inhibiting the increase in voltage-dependent transient (sodium) conductance of the nerve membrane, and it was of interest to see whether STX blocks the nerve excitation in the same way.

The study showed that, like TTX, STX blocks the nerve conduction by inhibiting the peak transient conductance increase, which is responsible for the rising phase of the action potential under normal conditions. STX resembled TTX in the following respects: (1) blockage of the action potential was not accompanied by a change in the resting potential; (2) recovery after washing was slow as compared to that of axons treated with local anesthetics; (3) effective concentrations were very low; (4) the peak transient conductance current was selectively blocked with no change in the steady-state conductance current; and (5) the time-to-peak transient current underwent little or no change. All these similarities

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3.239 EFFECT OF STAGE OR RIGOR AND OF FREEZING-THAWING PROCESSES ON STORAGE QUALITY OF REFROZEN COD

Peters, J. A. (U.S. Bureau of Commercial Fisheries Technological Laboratory, Gloucester, Massachusetts), W. A. MacCallum (Fisheries Research Board of Canada Technological Unit, St. John's, Newfoundland), W. J. Dyer, D. R. Idler, J. W. Slavin, J. P. Lane, D. I. Fraser, and E. J. Laishley
Journal of the Fisheries Research Board of Canada 25, No. 2, 299-319 (February 1968)

When one studies the effects of various treatments on the quality of frozen-thawed-refrozen fish, the state of rigor mortis, the method of freezing, the method of thawing, and the storage temperature are important variables. This study was undertaken to answer questions concerning these variables and to provide information on methods of freezing and thawing cod from the Grand Bank. The specific objectives of the study were (1) to define the effect on the quality of freezing fish in the pre- or postrigor condition, freezing in brine or by refrigerated plates, and thawing in water or by microwave energy; (2) to determine the effect of the preceding factors on the subsequent storage life of the refrozen fillets; and (3) to determine the feasibility of using microwave energy to thaw fish on a commercial scale.

Trawler-caught cod were frozen both pre- and postrigor in either a brine solution of 23 percent salt or between refrigerated plates. The frozen cod were thawed in either circulating water at 7° C. or in a conveyorized microwave oven.

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TRENDS IN PURSE-SEINING TECHNIQUE

COMPARISON OF SAXITOXIN AND TETRODOTOXIN

CONTINUOUS MICROWAVE COOKING SYSTEM

STORAGE QUALITY OF REFROZEN COD

2.9

implied that both toxins behave in the same way as far as the mechanism of nerve blockage is concerned.

There are, however, the following known differences between STX and TTX: (1) hypotension did not accompany muscular paralysis in the systemic action of STX, whereas it did in TTX; (2) nerves from the puffer fish and the newt were highly resistant to TTX, but were sensitive to STX; (3) when low concentrations of STX were applied to nerve fibers of frog, there was often a transient increase in the spike amplitude that was not seen after similar treatment with TTX; and (4) the block by STX was more readily reversible than was that by TTX.

Despite these differences between STX and TTX, the similarity in their nerve-blocking mechanism is worth considering in view of the recent finding on the relation of activity to structure in TTX derivatives; a minor change at carbon No. 4 of the TTX molecule could reduce the ability to block the peak transient conductance as shown with deoxytetrodotoxin. Deoxytetrodotoxin, STX, and TTX all contain a guanidinium group in their molecules. Therefore, in contrast to deoxytetrodotoxin, the STX molecule can exert the same cellular effect as TTX despite a different chemical structure. This supports the hypothesis that the guanidinium group is important and that it is this group of TTX that plugs the gate of the peak transient channel at the external surface of the nerve membrane and prevents the flow of sodium ions normally occurring upon stimulation.

Faster recovery after treatment with STX than after treatment with TTX is also noteworthy because the rate of recovery after washing is one of the important factors that must be considered when determining the mechanism of the drug-receptor binding or interaction. [13 references]

3.239

The thawed cod were then processed into fillets that were packaged, plate frozen, and stored at -18° C.

All the samples thawed satisfactorily in the circulating water. Some overheating was encountered during thawing in the microwave oven; however, the equipment was not sufficiently developed to allow assessment of the commercial potential of microwave thawing. Examination for appearance, odor, and texture of fillets prepared from the thawed fish indicated that prerigor freezing was preferable to postrigor freezing and that thawing by microwaves was preferable to thawing with water. The various freezing and thawing methods did not affect the pH of the thawed fillets.

Changes in the quality of the refrozen fillets that were packaged and stored at -18° C. for 12 months were determined by organoleptic and chemical tests. The results indicated that neither the average taste-panel scores nor the chemical tests for moisture, total lipid, free fatty acids, and extractable protein nitrogen showed any difference that could be attributed to state of rigor, method of freezing, or method of thawing. The taste panel expressed a slight preference for the texture of fillets from fish frozen prerigor and from fish frozen in brine. The free fatty acids increased sharply as a result of thawing and refreezing; the rapid increase continued during the first 2 months of frozen storage. Comparison of average values for free fatty acids of the fish with average scores of the taste panel showed a coefficient of correlation of - 0.974, which was significant at the 1-percent level. Comparison of average values for extractable protein nitrogen with average scores of the taste panel showed a coefficient of correlation of +0.924, which was significant at the 5-percent level. [38 references]

2.1475

The seine skiff performs a number of functions during the setting, hauling, and loading of purse seiners. Elimination of the seine skiff would result in a reduction in the size of the crew. The herring fisheries of Iceland and Norway have substituted other methods to eliminate use of a seine skiff. Many of the functions of the purse seine skiff could be eliminated at the critical phases of net hauling, and the crew could be reduced.

Pumping the catch on board has reduced the number of crew required for the loading operation and has increased the speed of loading; however, it has had little effect on the total number of crewmen, owing to the requirements for net handling. The use of a submersible fish pump has eliminated the priming problems and helped clean up the deck. This type of pump has the capability of being dropped deep into the net, thereby reducing the strain on the net and the physical effort required to maintain a concentrated mixture as the catch is pumped on board.

The unloading of the boat at the dock is a critical phase. It often takes longer to unload than it does to catch the entire capacity of the vessel. A new system that uses a submersible pump for unloading the vessel will probably be included in requirements for future vessels.

The critical phases of fish handling on tuna vessels are net handling and bringing the catch on board. The use of a separate freezing tank and stowage hold introduced further material-handling problems. The author recommends mechanized unloading of the vessel at high speed when it is compatible with receiving facilities at processing plants or when transshipment is contemplated.

3.19

in two 4 x 50 foot microwave steam ovens. The high-powered oven for large parts comprises 32 modules and has a power rating of 80 kilowatts of microwave energy at a frequency of 2,450 megacycles. The low-powered oven has 20 modules and is rated at 50 kw. and 2,450 megacycles. A silicon-coated fiberglass belt, which is compatible with microwave energy, conveys chicken parts through the ovens for top and bottom cooking. The steam for cooking is circulated through the ovens and regulated in three zones.

The precooked parts are discharged from the microwave-steam ovens onto an oscillating-type of distributing conveyor. Then the parts are uniformly distributed onto a belt that carries them through a three-section, 30-ft.-long chiller. The spray-type chiller cools the parts to about 50° F. before they are breaded. After being breaded, the parts go to a 17-tier freezer with 22 chain-driven trays, each holding about 20 lb. of chicken pieces in a single layer. Freezing to -15° F. takes 1½ hr. Frozen, precooked, breaded pieces are directly conveyed to the packaging area.

3.19 MICROWAVE APPLICATIONS IN THE FOOD INDUSTRY

Anonymous
Food Technology 20, No. 8, 34, 36 (August 1966)

The food industry's increasing interest in processing with microwaves is stimulating rapid development of new and improved microwave equipment and engineering systems. A specific application of such equipment in the food industry is the speed thawing of frozen fish delivered by fishing boats to permit rapid processing. [Abstracter: M. F. Tripple]

FISH TECHNOLOGY EXPERIMENT STATION,
Hoige Bazaar, MANGALORE-1.

4.11 (*) ANALYSIS FOR GEOMETRICAL AND POSITIONAL ISOMERS OF FATTY ACIDS IN PARTIALLY HYDROGENATED FATS

Scholfield, C. R., V. L. Davison, and H. J. Dutton (Northern Regional Research Laboratory, U.S. Department of Agriculture, Peoria, Illinois)
Journal of the American Oil Chemists' Society 44, No. 11, 648-651 (November 1967)

The analysis of partially hydrogenated fats and oils for isomeric monoenes and dienes necessitates a series of separations and analysis of the fractions for trans content and double bond position. Jones et al. (1965) described the separation of methyl esters into saturated, monoenoic, dienoic, and trienoic fractions by countercurrent distribution with an acetonitrile-hexane system. This separation was followed by countercurrent distribution with an argentation system to separate geometric isomers of monoenoic and dienoic esters. Double bond positions were then determined by permanganate-periodate cleavage and by gas-chromatography of the resulting dibasic esters. Although this procedure is capable of giving a complete analysis of monoenes and information about dienes, it is laborious and lengthy.

The liquid-liquid chromatographic procedures described in this paper require 1 day for each chromatographic separation, as compared to 3-5 days for countercurrent distribution. About 3-5 grams of methyl esters are required for the chromatographic method, whereas countercurrent distribution uses 35-40 g. In addition, double bond positions are determined by an ozonization-pyrolysis technique,

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 ABSTRACTER: M. F. Tripple

4.13 CANADIAN MARINE OILS OF LOW IODINE VALUE: FATTY ACID COMPOSITION OF OILS FROM NEWFOUNDLAND TURBOT (GREENLAND HALIBUT), CERTAIN ATLANTIC HERRING, AND A SABLEFISH

Ackman, R. G., C. A. Eaton, and P. J. Ke (Fisheries Research Board of Canada Halifax Laboratory, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 24, No. 12, 2563-2572 (December 1967)

Most oils from teleost fish of commercial importance have an iodine value (I.V.) in the range of 118-190. Fatty acid interrelations in triglyceride oils with iodine values as low as 100 have received little attention. The implications of such interrelations were sought by the authors, who examined herring oils; three samples of muscle oil from an Atlantic flatfish (Reinhardtius hippoglossoides), also known as Newfoundland turbot or Greenland halibut; and one sample of muscle oil from the sablefish (Anoplopoma fimbria), also known as black cod.

The results of analyses of the oil from the three species showed that these low I.V. oils possessed no unusual features when compared with marine oils in general. There was a sharp differentiation of fatty acids among the basic types (saturated, monounsaturated, and polyunsaturated with 5 and 6 double bonds); however, despite the low I.V. of these oils, the saturated fatty acids were not

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 ABSTRACTER: M. F. Tripple

4.11 SEGREGATION OF FISH OILS WITH LIQUID PROPANE AND BUTANE

Wisniak, Jaime, and Jorge Barrientos (Department of Chemical Engineering, Universidad Catolica de Chile, Santiago, Chile)
Journal of the American Oil Chemists' Society 44, No. 12, 743-744 (December 1967)

Fish oils contain a higher percentage of saturated and monounsaturated fatty acids. If fish oil is to be used as a drying oil or a coating oil, all or part of these components must be eliminated. Extraction with solvents can be used to modify the oil composition; solvent extraction is widely used to segregate and purify lubricants. Among the solvents used for selective fractionation are liquid hydrocarbons, such as propane. The solubility of triglycerides decreases with temperature, when liquid propane is used for fractionation. A lower critical solubility temperature (CST) exists, above which there are two phases in the equilibrium. The solubility of the components is determined by the degree of unsaturation and chain length. This study reports on the possibility of using liquid propane near its critical temperature to separate fish oils into two fractions having different iodine values.

Fractionation studies were done in a high-pressure autoclave provided with agitation and temperature controls. The oil and the hydrocarbon were charged and maintained at a fixed temperature until equilibrium was obtained in the fatty acid composition, as indicated by repeated sampling of the two phases.

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 ABSTRACTER: M. F. Tripple

4.15 (*) GAS CHROMATOGRAPHIC-MASS SPECTROMETRIC ANALYSIS OF ISOPRENOID HYDROCARBONS AND FATTY ACIDS IN SHARK LIVER OIL PRODUCTS

Gelphi, E., and J. Oró (Department of Chemistry, University of Houston, Houston, Texas 77004)
Journal of the American Oil Chemists' Society 45, No. 3, 144-147 (March 1968)

The hydrocarbons and fatty acids from shark-liver oil were analyzed because the distribution and formation of isoprenoid hydrocarbons are of current interest, and because there are no mass spectrometric data on the composition of shark-liver oil. Because they found a relatively high concentration of pristane in shark-liver oil but failed to detect phytane, the authors decided to extend the study of the C-20 isoprenoid to the analysis of pristane derived by distillation from the liver of the basking shark.

The liver oil from the South American basking shark was fractionated by silica-gel chromatography and analyzed by combined gas capillary chromatography and mass spectrometry. The major compounds of the nonsaponifiable fraction were pristane and squalene; these compounds account for 7.6 and 31.3 percent of the oil, respectively. The saponifiable fraction contained normal fatty acids from C-14 to C-22; the four major components of the saponifiable fractions were palmitic, oleic, and the monounsaturated eicosenoic and docosenoic acids. The authors did not observe a correlation between the hydrocarbons, which were

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 ABSTRACTER: M. F. Tripple

ANALYSIS OF FATTY ACIDS IN PARTIALLY HYDROGENATED FATS

SEPARATING FISH OILS WITH LIQUID PROPANE

IODINE VALUES AND FATTY ACID COMPOSITION OF HERRING OILS

ANALYSIS OF SHARK-LIVER OIL PRODUCTS

4.11

The gas released by the samples was measured with a meter; residual oil was then heated under vacuum to eliminate the last traces of solvent.

Separations performed at 65.6°, 77.1°, and 94.6° C. with liquid propane were plotted in a triangular extraction diagram. The plotted equilibrium curves were left open because it would have meant extracting an oil fraction obtained from the upper phase, which had an iodine value lower than that of the original oil. This procedure is not recommended because the equilibrium composition of the phases varied with the degree of extraction, depending upon the carbon chain length and saturation of the fatty acids in the oil.

Extraction efficiency is sometimes measured in terms of the separation range, which is defined as the difference in iodine values of both phases. For different equilibrium curves, the range decreased with temperature and, for the same curve, it decreases with decreased solvent-to-oil ratios. The decrease of the extraction range with temperature is explained by the decrease of solubility of triglycerides with temperature. If the temperature is increased to near the critical temperature of propane, which is 98.6° C., only the low molecular weight, low iodine value components will stay in solution. The extraction range is rather small, with steep slopes for the tie lines. This indicates the need of a large number of stages for doing the separation.

It was found with propane that for each 100-gram increase in molecular weight, the CST decreased by about 8.3° C. There must be at least a 5° C. difference in CST to effectively separate the two triglyceride phases.

4.11

which requires 1 hour and 5 milligrams of sample, as compared to 1 week and 50-100 mg. of sample for the permanganate-periodate method.

The esters are first separated into trienoate, dienoate, monoenoate-palmitate, and stearate fractions by liquid chromatography on a partially vulcanized rubber column. The monoenoate-palmitate fraction is separated into palmitate, trans monoenoate and cis monoenoate fractions by liquid chromatography on a silver-saturated cation exchange resin. The double bond positions in trans and cis monoenoates are located by ozonization and gas chromatography of the fragments. This liquid-liquid chromatographic procedure requires less time and uses simpler apparatus with smaller samples than the method based on countercurrent distribution does.

Application of the procedure to six partially hydrogenated samples is described. The data from analyses of two liquid oils and four shortenings are presented in this report. [12 references]

Karleskind, A.
Chemical Abstracts 67, No. 6, 23103h (August 7, 1967)

4.11 ALCOHOLS FROM UNSAPONIFIABLE SUBSTANCES.
APPLICATIONS TO THE STUDY OF MARINE OILS

STUDY OF MARINE OILS

4.15

essentially all isoprenoid derivatives, and the fatty acids of this oil, which were all essentially normal.

The same treatment was applied to a sample of commercial pristane that was obtained from the liver oil of the basking shark. The commercial pristane contained about 1 percent phytane and small amounts of octadecane, nonadecane, and methyl and ethyl palmitates. Mass spectral data for squalene are presented, along with the low electron energy-mass spectra for pristane and phytane.

The authors believe that pristane and small amounts of the unsaturated isoprenoid C-19 isomer come from the marine organisms on which the sharks feed. They presume that the primary source of pristane is the phytyl group of the chlorophyll from marine photosynthetic microorganisms. It is known that phytol can be easily dehydrated to phytenes and phytadienes, both of which could yield phytane when hydrogenated. The presence of phytane in commercial products of shark-liver oil could be accounted for by various sources of the oils or by the possibility that phytane is generated from certain precursors in the shark oil during the distillation process. [32 references]

Bhatty, M. K., Qamar Khalid, and A. H. Khan (Pakistan Council Sci. Ind. Res., Lahore, Pakistan)
Chemical Abstracts 67, No. 25, 115906a (December 18, 1967)

4.13 THE FATTY ACID COMPOSITION OF PAKISTANI ELASMOBRANCH FISH LIVER OILS. I - THE FATTY ACIDS OF (MUSTELUS MANAZO)

4.13

present to any abnormal extent. Ackman and Eaton (1966) had previously noted that total saturated acids decreased with decreasing I.V. in herring oils.

The monounsaturated fatty acids are the components primarily responsible for the low I.V. of oils. Other investigators have determined that herring oils with low I.V. are typical clupeid oils with larger proportions of 22:1 acids than of 20:1 acids. These acids were less abundant components in the oils from the flatfish and the sablefish. Accordingly, the totals for 16:1 and 18:1 were almost twice as high in the oil from these species as in the herring oils. The equivalence of these acids is suggested by the ratio 16:0(16:1 + 18:1). Values for 16:1 and 18:1 were moderately consistent for herring and averaged 0.50 in this study as compared with 0.56 in the previous samplings of herring oils by Ackman and Eaton (1966). Oils from the other two species did not differ markedly from each other in this ratio, as compared with the differences in the ratio 16:0/16:1, but the oils were different from the herring oils.

The distribution of the monounsaturated fatty acid isomers in the C-16, C-18, C-20, and C-22 chain lengths of the flatfish oils did not differ notably from the distribution of these acids shown in data for herring oil and cod-liver oil. The authors regard this as a further reason for considering these oils not as unique, but rather as extremes of normal composition patterns. [21 references]

FATTY ACID COMPOSITION OF SHARK-LIVER OIL

4.90 (*) A GROWTH AND ANTI-PEROTIC FACTOR IN MENHADEN FISH OIL

Atkinson, R. L., J. W. Bradley, J. R. Couch, and J. H. Quisenberry (Department of Poultry Science, Texas A and M University, College Station)
Federation Proceedings 27, No. 2, Abstract No. 219, p. 254 (March-April 1968)

Turkey poults were fed rations containing protein at levels of either 27.5, 30.0, or 32.5 percent. These rations were supplemented with either soybean oil or menhaden oil at levels of 0.75, 1.75, or 3.0 percent. Menhaden oil at a level of 0.75 percent produced a significant improvement in growth over that obtained with the same percentage of soybean oil. The growth response with the fish oil averaged 7 percent for males and 15 percent for females. The cause of the difference in response between sexes is not known at this time; however, a differential sex response to the growth factor in fish solubles has been observed in recent work. Little or no growth response was obtained when the diets were supplemented with high protein levels and fish oil above 0.75 percent.

In a battery experiment, 1 or 2 percent menhaden oil was added to a turkey starter feed containing 27.5 percent protein and 2.5 percent soybean oil. In each case the fish oil replaced an equivalent amount of soybean oil No growth response was obtained in this experiment; however, the incidence of perosis* was 14 percent in the control group. The presence of an antiperotic factor in the menhaden oil was shown by the test groups where the addition of 1 percent menhaden oil reduced the incidence of perosis to 7 percent, and addition of 2 percent

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 ABSTRACTER: M. F. Tripple

6.199 THE EFFECT OF HIGH LEVELS OF CALCIUM, FISH PRODUCTS AND SODIUM BICARBONATE ON EGG SHELL QUALITY

Pepper, W. F., J. D. Summers, and J. D. McConachie (Department of Poultry Science, University of Guelph, Guelph, Ontario, Canada)
Poultry Science 47, No. 1, 224-229 (January 1968)

The effect of various dietary treatments, such as fish meal and fish oil, on the quality of egg shells was investigated.

Various treatments were randomly assigned to groups of eight White Leghorn pullets; there were six such groups in each experimental treatment. The basal, or control, ration was formulated to contain 16 percent crude protein and 3 percent calcium. An additional 1, 2, or 3 percent of calcium was added to the basal diet to form three experimental diets. A further treatment consisted of feeding the basal diet only from 8 a.m. to 4 p.m., which meant that this group of pullets received only oyster shell for 6 hours of their 14-hour day (6 a.m. to 8 p.m.). Additional experimental diets consisted of the basal diet plus 5 percent of herring meal, the basal diet plus 0.5 percent of cod-liver oil, and the basal diet plus 0.1 percent of sodium bicarbonate. The fish meal and cod-liver oil were added to the basal diet because, on a number of occasions, egg shells from flocks fed liberal quantities of fish meal were of a better quality than were egg shells from flocks fed little or no fish meal. By equalizing the calcium in the experimental diets with that of the control diet, the authors

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 ABSTRACTER: M. F. Tripple

5.123 VITAMIN E AND STRESS. INTERRELATIONSHIPS BETWEEN POLYUNSATURATED FATTY ACID STRESS, VITAMIN A AND VITAMIN E IN THE RAT AND THE CHICK

Green, J., I. R. Muthy, A. T. Diplock, J. Bunyan, M. A. Cawthorne, and Elspeth A. Murrell (Walton Oaks Experimental Station, Vitamins Ltd., Tadworth, Surrey, England)
British Journal of Nutrition 21, No. 4, 845-864 (1967)

In previous experiments, the authors found no evidence for enhanced lipid peroxidation in the chick or the rat in the absence of vitamin E or selenium; nor did the authors consider that these two substances functioned as antioxidants in vivo (Green et al., 1967; Diplock et al., 1967; and Bunyan et al., 1967). If a biochemical relation exists in vivo between vitamins A and E, the authors did not deem it possible to attribute it to the relation between an oxidizable substrate and an antioxidant. Therefore, they reinvestigated the nature of the relation between vitamins A and E in the rat and the chick.

Stress induced by diets rich in polyunsaturated fatty acids (PUFA) had no effect on the reserves of vitamin A in the liver of rats deficient in vitamin E when the rats were given dietary vitamin A or repeated, small, oral doses of vitamin A. Dietary PUFA did not affect the reserves of vitamin A in the liver of young rats given necrogenic diets deficient in vitamin E and selenium, nor were these reserves affected by the onset of liver necrosis or the preventative action against necrosis by selenium.

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 ABSTRACTER: M. F. Tripple

6.31 (*) SEASONAL VARIATION OF FREE AMINO ACID COMPOSITION OF CHONDRUS OCELLATUS

Takagi, Mitsuzō, Keiichi Oishi, and Ayako Okumura (Lab. of Sea Food Chem., Fac. of Fish., Hokkaido Univ., Hakodate, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 33, No. 9, 834-838 (September 1967)

Samples of Chondrus ocellatus were analyzed for free amino acids every 2 weeks from April 6 through June 15. Some of the results follow. All quantities are in milligrams percent on a dry weight basis. S-hydroxymethyl-L-homocysteine steadily decreased from 533 on April 6 to 1 by June 15; glutamic acid from 418 to 51. Citrulline decreased from 335 on April 6 to 261 by May 4, rose to 299 by May 18, and then abruptly decreased to 38 by June 15; taurine behaved similarly--from 302 to 206, up to 268, and then down to 112. Aspartic acid, cysteic acid, serine, chondrine, alanine, and threonine decreased with varying amounts of fluctuation from 79, 49, 46, 39, and 32, respectively, to 16, 32, 6, 5, 23, and 4, respectively. The amounts of glycine (24), phenylalanine (21), lysine (14), D-cysteinolic acid (11), leucine (10), valine (9), isoleucine (8), arginine (6), and ammonia (6), though smaller, also fluctuated. The remaining amino acids varied in quantity from none for tryptophan to as much as 3.5 for methionine on May 4.

The ratio of nitrogen in each amino acid to the total nitrogens and ammonia changed seasonally and abruptly, too. For example, the ratio for citrulline increased from 32 to 44 percent between April 6 and May 18, then decreased to 19

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 ABSTRACTER: L. Baldwin

GROWTH AND ANTIPEROTIC FACTOR WITH FISH OIL

RELATIONS BETWEEN FATTY ACIDS AND VITAMINS A AND E

EFFECT OF FISH MEAL AND OIL ON EGG SHELL QUALITY

SEASONAL VARIATION OF AMINO ACIDS IN MARINE ALGA

5.123

The effect of dietary PUFA on the rate of depletion in the liver of vitamin A reserves in weanling rats or rats initially depleted of vitamins A and E and then given a single large dose of vitamin A was studied over periods ranging from 2 to 12½ weeks. In three experiments, the dietary PUFA did not significantly accelerate depletion of vitamin A. In one experiment, the rate of depletion was increased; however, this rate was not reversed by dietary vitamin E, so it was attributed to a toxic effect as it could not be attributed to an enhancement of peroxidation in vivo. The effect of vitamin E in these experiments was not consistent, but in general it slightly decreased the rate of depletion.

Large doses of vitamin A did not affect the metabolism of small amounts of [^{14}C]D-α-tocopherol in the rat or chick deficient in vitamin E when interaction of the two vitamins in the gastrointestinal tract was prevented. Large doses of vitamin A were given to chicks deficient in vitamin E; the chicks were receiving a diet containing 1 percent linoleic acid as maize oil esters. The vitamin A did not accelerate the onset of encephalomalacia and therefore failed to exert a prooxidative effect on tissue tocopherol.

The authors drew the conclusion from these experiments that any relation that may exist in vivo between vitamins A and E is not concerned with an effect of vitamin E in preventing oxidation of vitamin A. A critical view of the literature on the nature of the relation in general supported the conclusion of the authors. [60 references]

6.31

percent by June 15. The ratio for glutamic acid fluctuated between 16 and 13 percent till June 1, then dived to 10 percent by June 15. The values for S-hydroxymethyl-L-homocysteine slowly decreased (from 18 to 12 percent) during the first 6 weeks of analysis, then rapidly decreased (from 6.6 to 0.2 percent) during the last 6 weeks. The values for taurine remained fairly steady (around 12 and 13 percent) for the first 6 weeks, then rose rapidly (from 19 to 26 percent) during the last 6 weeks.

Values for cysteic acid increased steadily, except for a slight decrease the last of April and the first of May, from 1.5 to 5 percent. No values were evident for proline till the first of June; then they jumped from over 5 to almost 8. Phenylalanine and D-cysteinolic acid were the only amino acids whose ratios rose without interruption--phenylalanine ratios were 0.7 and 0.9 during the first 6 weeks, then rose from 1.2 to 2.6 during the last 6; D-cysteinolic acid ratios remained around 0.4 and 0.5 during the first 6 weeks, then rose from 1.1 to 1.9 during the last 6. [8 references]

6.31 PHOTOSYNTHESIS AND RESPIRATION IN SOME SEAWEEDS

Kanwisher, John W. (Woods Hole Oceanog. Inst., Woods Hole, Mass.)
Chemical Abstracts 68, No. 21, 93538y (May 20, 1968)

4.90

menhaden oil completely eliminated perosis. *[A nutritional disease of young fowls characterized by a slipped tendon and consequent distortion or dislocation of the limb bones. Manganese, biotin, and choline are preventives.]

4.90 OIL-ENRICHED FEED. V - NUTRITIVE VALUE OF EXTRACTED OIL FROM FISH SOLUBLES

Akiya, Toshimi, Megumi Yamazaki, and Taeko Shimizu (Food Res. Inst., Tokyo, Japan)
Chemical Abstracts 65, 11248a (September 26, 1966)

4.90 EFFECT OF SHARK LIVER OIL ON PLASMA CHOLESTEROL AND LIPOPROTEIN PATTERNS IN MAN

Salah, M. K., M. Y. Hamed, and A. S. Fayzalla (Assiut Univ., Cairo, Egypt)
Chemical Abstracts 67, No. 15, 71474b (October 9, 1967)

6.199

hoped to determine whether factors other than calcium in fish meal may be influencing the quality of egg shells.

Increasing the level of calcium in the diet reduced the number of eggs; the birds fed an additional 3 percent of calcium produced significantly fewer eggs than did the birds fed the control and fishmeal-supplemented diets. Since egg numbers were adjusted to equal feed intake, the decrease in production associated with increased levels of calcium is probably only a reflection of a difference in nutrient intake of the pullets. When birds can consume enough feed to overcome the nutrient-diluting effect of extra calcium, production should not be influenced by higher levels of dietary calcium.

There was no significant difference in average egg weight between the experimental groups. Nor was there any improvement in egg specific gravity when cod-liver oil or fish meal was added to the diets. This suggested to the authors that there is nothing in these products that favorably affects shell quality more than nutrients found in the basal diet. A low specific gravity obtained with the fishmeal diet could be the result of the increased number of eggs with this group.

The present study failed to show any significant differences in quality of egg shells as measured by specific gravity, egg shell weight, or shell weight per unit surface area for the different diets. This was true whether cod-liver oil, fish meal, or sodium bicarbonate was added to a basal diet. The improvement in egg specific gravity noted with increased dietary calcium suggested that such an increase may improve the quality of egg shells. [13 references]

6.38 THE SPONGE INDUSTRY OF TARPON SPRINGS

Ferry, Myrtle (Tarpon Springs Sponge Exchange, Tarpon Springs, Florida)
Commercial Fisheries Review 29, No. 10, 82-86 (October 1967)

Both hooking and diving are used to harvest sponges at Tarpon Springs, Florida. The hooker works from a small dinghy near the mother ship. He kneels in the bow and searches for sponges with a glass bottom bucket. When he locates a sponge on the sea floor, he lowers a long pole with a pronged iron hook attached. The width of the hook is used to measure the sponge. If the sponge is of legal size, the hooker sets the hook into the sponge near its base and lifts it into the boat. Hookers usually work in depths of 30 to 40 feet if the water is clear.

The diving boats working out of Tarpon Springs are of the same design as those used in the Mediterranean. The vessels are diesel powered and steered by tiller. Four crewmen and two divers are needed. Sponge divers wear a rubberized suit with helmet and breastplate. Air is pumped into the helmet by an air pump aboard the boat. The boats are provisioned to allow the crew to stay at sea for up to 6 weeks. Diving operations are conducted at depths up to 125 feet. When the sponges are sent to the deck, they are stepped on by the barefoot crew to hasten death of the soft animal matter. Then the sponges are repeatedly washed with sea water and hung on lines to dry.

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 ABSTRACTER: M. F. Tripple

6.54 POSSIBLE TOXICITY OF FISH FLOUR
(*)

Anonymous
Nutrition Reviews 26, No. 2, 58-61 (February 1968)

The benefit derived from using fish protein concentrate (FPC) as a supplement to human diets is due to its high biological value; FPC has been shown to produce greater weight gains than a similar level of casein will. Morrison and Campbell (1960) found that when white flour was supplemented with 10 percent FPC, the bread baked from the flour had a much higher biological value than bread baked with unsupplemented white flour has. The marked improvement in the growth of rats eating the supplemented flour was attributed to the fact that FPC contains 1.9 g. of lysine per 16.0 g. of nitrogen.

A number of investigators have suggested that the solvent used in preparing the FPC may influence its biological value. Morrison et al. (1962) found that FPC could become toxic if it was treated with chloroform; rats fed FPC prepared with chloroform extraction did not show an increase in growth. However, the chloroform as such was not the cause of toxicity, since it had presumably been removed when the flour was heated. Histological examination provided further evidence that the chloroform did not cause the toxicity.

A growth-inhibiting effect apparent when the ration contained a high level of FPC was overcome by ether extraction, which reduced the level of organic chlorides in the FPC. Morrison et al. (1962) found no evidence that FPC prepared by

*Item on back of card. (over)

 ABSTRACTER: M. F. Tripple

6.54 THE FISH PROTEIN CONCENTRATE STORY:
BRINGING THE PRODUCT HOME
5. BUREAU OF COMMERCIAL FISHERIES PROGRAM

Snyder, Donald G. (Bureau of Commercial Fisheries Technological Laboratory, College Park, Maryland 20740)
Food Technology 21, No. 9, 70-71 (September 1967)

The major purpose of the research on fish protein concentrate (FPC) by the Bureau of Commercial Fisheries (BCF) was to study the manufacture and use of FPC as a major deterrent against global protein malnutrition and as a potential economic stimulus to the American fishing industry. The research program was initially conceived in 1961 to encompass several areas of research; it was later accelerated to effect participation between the Government and industry in getting FPC in a desirable form and at a reasonable price to the people who need it.

The BCF decided the most meaningful way to utilize research funds would be to conduct a global survey of methods used or contemplated for the manufacture of FPC. The results of this survey indicated the following reasons why current programs were not resulting in significant action: (1) None of the many efforts made toward the development of manufacturing methods for FPC had met with complete success because the methods were either beseiged with processing problems or resulted in unsatisfactory products. (2) Almost all the attempts were based on a single process; a multidisciplinary approach was not taken. Also, few efforts at

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 ABSTRACTER: M. F. Tripple

6.55 FISHERY PRODUCTS OF COMMERCE -- FISH ENSILAGE
(*)

Anonymous
Fish Technology Newsletter, CIFT 5, No. 1 (April 1964) (Ernakulam, India)
Indian Fisheries Bulletin 11, No. 3, 12-13 (July 1964)

Fish ensilage is so called because the process of preparation is quite similar to that for ensiling crops. It is a grayish, viscous form of fish meal; yet it is a better nutritive source than fish meal is, for its water-soluble proteins are more readily assimilated than those of fish meal, which must be digested before being absorbed. Its proximate composition is 80 percent water, 20 percent total solids, 11.4 percent protein, 2.1 percent fat, and 1.2 percent ash. In addition, it contains thermolabile vitamins and several important minerals. Its pepsin digestibility is 91.6 percent.

The preparation of fish ensilage requires no elaborate or expensive equipment. The process is so simple that even the average farmer can ensile fish on a small scale.

1. Select any kind of fresh, nonoily fish, preferably a kind that is not suited for human consumption.

2. Mince the fish thoroughly.

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 ABSTRACTER: L. Baldwin

FLORIDA SPONGE INDUSTRY

RESEARCH ON FISH PROTEIN CONCENTRATE

POSSIBLE TOXICITY OF FISH PROTEIN CONCENTRATE

PREPARATION OF FISH ENSILAGE

complete merchandizing were made to develop interest in FPC. (3) Research efforts were inadequately funded to bring preliminary work to a reasonably rapid conclusion. Private industry decided that the results were not certain enough to warrant the expense for research. An important issue was that to be economical, FPC would have to be prepared from whole fish. The Food and Drug Administration (FDA) informally ruled that FPC could not be made from fish containing viscera and heads. This ruling caused an adversed effect on FPC utilization in other countries.

Production of FPC involves removal of water and oil from raw fish. Methods to accomplish this removal include solvent extraction, use of enzymes or microorganisms, and electrical or thermal procedures. The BCF began a broadly based research program and obtained equipment to study these three manufacturing approaches. The equipment was of sufficient scale to allow evaluation of the products and collection of data to be used in the design and programming of studies in larger units. The product obtained from this equipment was evaluated to determine the effects of varying the raw material and the effect of several chemical- and biological-processing conditions on the nutritive, chemical, and physical qualities of the FPC.

In 1967, the FDA approved the use of FPC as a human food additive. Now that hake and hakelike species of fish have been approved by FDA for use in the manufacture of FPC, the BCF has begun studies on fatty fish, such as menhaden, anchovy, and herring. The data collected from these studies will be used to formulate a second food additive petition requesting approval to use fatty fish in the production of FPC. [9 references]

Fetisova, T. I., V. M. Shirokova, and V. M. Sebekina
Chemical Abstracts 67, No. 5, 20783u (July 31, 1967)

3. Place the minced flesh in a metal drum that has been painted inside with bitumen (a bitumen coating resists acid).

4. Add 4 percent by weight of formic acid and mix well. Sulfuric acid can be used if the pH of the digested product is reduced to 4 or 5 with formic acid.

5. Cover the drum with a lid and leave until the acid has broken down the flesh and bones into a homogeneous slurry.

6. Keep the slurry (the fish ensilage) in stoppered containers at a pH of 4 or 5.

Before the product is mixed with feed, its acidity should be neutralized with chalk. It can be used in the proportion desired--up to 3 lb. a day can be incorporated into cattle feed without causing a fishy taint in the milk or butter. In actual practice, much less is needed for the proper nutrition of cattle. It can also be fed to poultry. When it is, it not only induces better yield but also seems to have a curative effect on feather picking.

Sponge auctions are held twice a week, if there are any sponges to be sold. Each lot of sponges is bid on separately and is sold to the highest bidder. The buyers take the sponges to their warehouses, where the sponges are sorted, trimmed, and classified according to size and quality. The qualities determining the commercial value of a sponge are color, size, shape, softness, durability, resiliency, and absorptiveness. The best known and most valuable sponge is the Rock Island Sheepwool Sponge, which is unequaled for durability, absorptiveness, and general utility.

The sponge industry of Tarpon Springs has suffered many fluctuations. The peak year was in 1936, when production reached more than $3 million. Several prosperous years followed, and more than 75 sponge boats were kept busy. Beginning in 1943 and continuing through 1949, the sponge beds suffered a disease known as "red tide" that all but closed the industry. Of the original fleet, only about 12 or 15 boats were maintained. The sponge beds gradually began to regain their health and became productive again. By 1960, production was up to $425,000 and remained near this figure until 1966, when it fell to about half. In 1967, a tremendous amount of healthy sponges on the beds is waiting to be gathered, but production is acutely limited. In fact, the resource badly needs harvesting or the overgrowth will cause the beds to become dormant, and the resource will cease. The present problem in harvesting is lack of manpower because the older men of the industry cannot carry the burden, and the younger generation prefers less arduous occupations.

ethylene dichloride might produce deleterious effects. Morrison and Munro (1965) reported that there was a reduction in the cystine content when freeze-dried cod fillets were refluxed for 16 hours with ethylene dichloride. On the basis of their findings, Morrison and Munro felt that ethylene dichloride and cystine reacted to form a thioether, S,S′-ethylenebiscysteine, which is considered to be biologically unavailable.

A study by Huber and Slade (1967) showed that calves died when fed a diet containing FPC prepared by ethylene dichloride extraction as the only source of protein. The deletrious effect of FPC as the sole source of protein could not be attributed to any apparent change in amino-acid content. It is likely that the FPC used in this experiment contained a toxic substance associated with the solvent used in the extraction.

Unfortunately, it has not been determined if S,S′-ethylenebiscysteine is toxic. It would be desirable to determine the presence of this cystine derivative in the FPC used by Huber and Slade. On the basis of the preceding work, it would also be desirable to give attention to the possible toxic effects produced by feeding FPC manufactured by various methods. Such studies should involve both a variety of animal species and levels of FPC high enough to provide the animals with their only source of dietary protein. [14 references]

Okada, Mitoru, and Ichiro Komori (Tokaiku Suisan Kenkyusho, Tokyo, Japan)
Chemical Abstracts 63, 10570a (October 11, 1965)

LIVESTOCK FEED FROM FISHERY WASTES

ACIDIFYING LACTONE IN FISH MEAT JELLY

7.84 ULTRASOUND BACKSCATTER IN FRESH AND THAWED ANIMAL TISSUE

Freese, M. (Fisheries Research Board of Canada Freshwater Institute, Winnipeg, Manitoba, Canada), and D. Makow (Photogrammetric Research, Division of Applied Physics, National Research Council of Canada, Ottawa, Ontario, Canada)
Journal of the Fisheries Research Board of Canada 25, No. 3, 605-606 (March 1968)

Values of velocity and absorption of high-frequency ultrasound in animal tissue can be correlated to a certain degree with the quality and composition of the tissue. Although this approach has received some attention, no effective inspection method based on measurements of these parameters has been developed. One difficulty has been that measurements of these values require exacting conditions and precise instrumentation, such as an accurate time base, attenuator, and measurement cell.

The authors found that the backscatter of high-frequency ultrasound from beef and fish tissue differed markedly for fresh tissue and for tissue that had been thawed and refrozen. Initial tests showed that backscatter was dependent upon the rate of freezing and the number of times a sample has been thawed and refrozen.

A pulsed transducer ringing at 3.16 MHz for 1.5 μseconds was used for measurements of backscatter. A focused ultrasonic beam was directed through water at the immersed sample. Part of the incident beam penetrates the sample and is scattered at tissue interfaces having different acoustic impedances.

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 ABSTRACTER: M. F. Tripple

7.89 (*) CATTY ODOURS IN FOOD: THEIR PRODUCTION IN MEAT STORES FROM MESITYL OXIDE IN PAINT SOLVENTS

Patterson, R. L. S., and D. N. Rhodes (Meat Research Institute, Langford, Somerset, England)
Chemistry and Industry No. 47, 2003-2004 (November 25, 1967)

In a previous article, Pearce et al. (1967) reviewed the chemistry of the formation of compounds having "catty" odors from the reaction of hydrogen sulfide and minute quantities of mesityl oxide. Aylward et al. (1967) demonstrated that various vegetable foodstuffs become tainted with a catty odor when subjected to a heat treatment in the presence of mesityl oxide. The authors investigated the contamination of meat carcasses that developed a catty odor when stored for about 48 hours at about 2° C. in a freshly painted cold-storage room.

The authors used gas chromatography and mass spectrometry to show that one component of the thinners used in the paint contained about 0.4 percent mesityl oxide. A substance with a catty odor was formed when the mesityl oxide was treated with hydrogen sulfide gas. This substance was chromatographically identical with the substance having a catty odor, which was recovered from the contaminated meat. The other component of the thinners did not contain mesityl oxide and did not produce a catty odor when treated in the same way.

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 ABSTRACTER: M. F. Tripple

7.879 A GAS CHROMATOGRAPHIC METHOD FOR DETERMINATION OF THE RANCIDITY OF HERRING OIL

Kiesvaara, Martti, Olavi E. Nikkilä, and Kaj Westergren (The State Institute for Technical Research, Laboratory for Food Research and Technology, Otaniemi, Finland)
Acta Chemica Scandinavica 21, No. 10, 2887-2888 (1967) (Munksgaard 47, Prags Boulevard, Copenhagen, South Denmark)

The rancidity of the oil of semisterile preserved herring is usually measured by determination of the peroxide number, carbonyl number, or thiobarbituric acid (TBA) number. These numbers usually increase at the beginning of rancidity and decrease again after a period of time. Consequently, their application for evaluating the quality of an aged product is limited.

Scholz and Ptak (1966) developed a method for gas-chromatographic measurement of rancidity of vegetable oils. These investigators used the method to detect pentane in cottonseed oil, peanut oil, corn oil, and soybean oil, and to demonstrate the correlation between the pentane content and organoleptic quality. It has long been known that pentane and other hydrocarbons are present in rancid oil. Buttery et al. (1961) suggested that hexanal is the source of saturated hydrocarbons C_1 to C_5, and that the production of these hydrocarbons is catalyzed by fat peroxides. Scholz and Ptak found that pentane was always present in hexanal that was purified by distillation and preparative gas chromatography, and that the concentration of pentane increased upon standing. Scholz and Ptak

(over)

 ABSTRACTER: M. F. Tripple

8.51 AMINO-ACIDS AND AMINO-SUGARS IN CALCIFIED TISSUES OF PORTUNID CRABS

Degens, Egon T., Francis G. Carey, and Derek W. Spencer (Woods Hole Oceanographic Institution, Woods Hole, Massachusetts)
Nature 216, No. 5115, 601-603 (November 11, 1967)

The various parts of the exoskeleton of portunid crabs exhibit a wide range of hardness and rigidity. Because the extent of mineralization largely determines the flexibility and hardness of the exoskeleton, the authors were interested in identifying the important factors in this calcification process. Prior work on mineralization in biological systems had shown that the proteinaceous matrix in calcified tissues provided a set of specific templates. The availability of free carboxyl and amino groups are essential in nucleating a mineral phase; these groups are provided by certain acidic and basic amino acids. The authors decided to determine the amino-acid and amino-sugar composition of representative regions in the exoskeleton of crabs and to relate these data to the calcification phenomena.

The interrelations within and between the amino acids, amino sugars, and calcium were studied using factor analysis. The analysis showed that 83 percent of the total variance of the data was explained by only four groups of covariant compounds. A covariant group consisting of aspartic acid, tyrosine, serine, phenylalanine, glycine, and threonine was negatively correlated with a group consisting of

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 ABSTRACTER: M. F. Tripple

ULTRASOUND BACKSCATTER IN FRESH AND THAWED TISSUE

DETERMINATION OF RANCIDITY OF HERRING OIL

CATTY ODORS IN STORED MEAT

AMINO ACIDS IN CRAB EXOSKELETON

7.879

assumed that the pentane was produced from hexanal by a photo-initiated reaction. Because heptanal is the aldehyde present in the largest amounts in rancid herring oil, the authors expected hexane to be one of the final products in rancid fish oil.

Herring was packed under a light vacuum and stored at +30° C. for 1, 3, 5, 7, and 10 days before analysis. Acetone was used as the internal standard because of its short retention time and because it was eluted at a position where no other components interfered. Comparable results as shown in the table were obtained by dividing the ratio of the areas of the assumed hexane peak and the acetone peak by the weight of the oil sample in kilograms.

Storage time (Days)	Peroxide Number	Ratio of peak areas to kilograms of oil
1	8	2.5
3	2	4.4
5	0	2.1
7	0	3.8
10	0	130.0

A 7-day lag phase was observed before an appreciable increase was apparent in the value derived. After 10 days, the content of the component assumed to be hexane had increased by 52-fold. The peroxide number returned to its initial level in 5 days. The assumed hexane peak greatly exceeded the peak of pentane. There was a slight indication of rancid odor from the oil after 10 days.

8.51

lysine, proline, methionine, calcium, and the ratio of the amino sugars to total protein. A third covariant group consisting of glutamic acid, valine, alanine, leucine, and isoleucine was independent of the first two groups. A fourth group consisting of arginine, histidine, and hydroxylysine was similarly independent. The authors believe that the association of the first two groups is related to the calcification process. As for the third group (the one containing glutamic acid and isoleucine), different individual crabs have different relative amounts of the amino acids, so hardness of the exoskeleton is probably an environmental resultant.

The increase in lysine and OH-lysine with progressing calcification is in agreement with the idea that both amino acids may provide nucleation sites for crystal growth. Since chitin may also contain free amino groups, the higher yields of glucosamine in the mineralized regions of the exoskeleton may also be linked to calcification. If dicarboxylic acids are essential in providing negative sites for the fixation of calcium, their effect is masked by other factors.

Crustacean cuticles are hardened by tanning and mineralization processes. An increase in tanning is usually accompanied by a reduction in mineral deposition and vice versa. Therefore, at least two distinct protein matrices are contained in the rigid structures of the exoskeleton of the crab. This phenomenon is analogous to the occurrence in mollusk shells of mineralized proteins and a periostracum. [16 references]

7.84

Some of the scattered energy is reflected back to the transmitting transducer that also acts as the receiver. The received echoes are amplified, demodulated, and displayed as a function of time, which is about proportional to tissue depth. The oscilloscope traces obtained are called A-scans.

The original rate of freezing can be roughly estimated from the number and amplitude of the noise peaks. A moderate freezing rate at -20° C. ambient resulted in numerous peaks having low average amplitudes; a slower freezing rate at -5° C. ambient resulted in slightly fewer distinct peaks but larger average amplitudes. Similar results were obtained when the transducer was placed in contact with the sample.

Changes in backscatter are primarily due to the presence of numerous small cavities in the tissues caused by the formation of ice crystals and by dissolved air that comes out of solution during the freezing process. The size and number of these cavities, which affect the amplitude distribution of tissue noise, are highly dependent on the rate of freezing. Therefore, the noise amplitude distribution can be related directly to the manner in which the sample was frozen and the general physical condition of the tissue.

The described backscatter property may be applied to quality control and inspection of fish and meat; it might also be extended to food products other than animal tissue. Because of its simplicity, the contact method might probably be preferred in cases where good contact can be maintained.

7.89

The authors concluded that mesityl oxide continued to be evolved from the paint film after it had set and the main solvent had evaporated. The mesityl oxide was absorbed by the meat and combined with the hydrogen sulfide in the tissues to produce the catty odor. The lithophilic nature of the odor would lead to its retention in the fat of the tissues.

The authors draw attention to the danger inherent in the use in food stores of paints or solvents containing mesityl oxide as an impurity. Foodstuffs of both vegetable and animal origin can produce hydrogen sulfide that reacts with mesityl oxide. Animal foodstuffs support bacterial growth at chill temperatures and contain considerable quantities of sulfur-containing amino acids, thus they are more likely to be affected. The minute quantities of mesityl oxide involved and the ease with which serious contamination of meat by catty odor can arise within 48 hours at temperatures near 0° C. emphasize the need for the complete elimination of mesityl oxide from the paint formulas used in meat stores.

Biro, G. (Allatorvosi Tudomanyi Egyetem Elelmiszerhigieniai Tanszek, Budapest, Hungary)
Chemical Abstracts 67, No. 25, 115823w (December 18, 1967)

7.89 APPLICATION OF THE REDUCTASE ENZYME TEST FOR THE INVESTIGATION OF THE MICROBIOLOGICAL CONTAMINATION OF FRESH WATER FISH AND CONFECTIONERY PRODUCTS

9.12 (*)

STUDY ON FISHES GATHERING AROUND FLOATING SEAWEED. I - ABUNDANCE AND SPECIES COMPOSITION

Ida, Hitoshi, and Yoshio Hiyama (Fisheries Dept., Faculty of Agriculture, The University of Tokyo, Japan); and Takaya Kusaka (Ocean Research Institute, The University of Tokyo, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 33, No. 10, 923-929 (October 1967)

Parr (1929) described the species composition and the seasonal variation of the seaweeds floating in the Sargasso Sea. Uchida (1926 and 1927) and Uchida and Shojima (1958) studied floating seaweeds in terms of the fish that gather around them. The present authors extended these studies by investigating the seasonal changes and drift movements of floating seaweeds, the species composition of the fishes that gather around them, and the period of time that fish larvae stay attached. The investigations were conducted in Sagami Bay during the summers and autumns of 1962-1964.

Predominant species attracted by the seaweed were Stephanolepsis [Monacanthus] cirrhifer, Dasson trossulus, Abudefduf vaigiensis, Oplegnathus fasciatus, Sebastes [Scorpaena] inermis, Seriola quinqueradiata, Kyphosus cinerascens, and Trachurus japonicus. Of the sargassum examined, Sargassum ringgoldianum, which has a large thallus, attracted the most fish, the ratio of fish caught to sargassum examined being 18.7. In contrast, S. patens, which has a very fine thallus,

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*Item on back of card.

 ABSTRACTER: L. Baldwin

9.125

THE ULTRASTRUCTURE OF THE WHITE STRIATED MYOTOMAL MUSCLE OF THE COD, GADUS MORHUA

Bishop, C. M., and P. H. Odense (Fisheries Research Board of Canada Halifax Laboratory, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 24, No. 12, 2549-2553 (December 1967)

The authors describe the fine structure of white truncal muscle of cod (Gadus morhua) for two reasons: (1) to compare cod muscle with the muscles of other animals and (2) to provide a basis of comparison when studying the ultrastructural changes in the fillet that are associated with the effects of processing and storage.

In cross section, the muscle fiber consists of rectangular outer fibrils with a length normal to the sarcolemma. The outer fibrils surround smaller inner fibrils of irregular shape. Most nuclei and mitochondria are near the sarcolemma, but they are occasionally seen in extensions of the sarcoplasma into the fiber. The sarcomeres are similar to those of other vertebrates; the arrangement of the filaments in longitudinal and transverse section resembles that in rabbit skeletal muscle. The A zone of the fibril is 1.3 μ long. The actin filaments have an orderly tetragonal arrangement with cross connections at the Z band; this arrangement has also been described in the frog skeletal muscle. The most distinctive feature of the fibril of muscle is a fairly clear N band, which shows as a dark region in the I band about half way between the Z line and

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 ABSTRACTER: M. F. Tripple

9.11 (*)

SOME CHARACTERISTICS OF THE EPIBENTHIC ENVIRONMENT OF TIDAL SHOALS

Marshall, Nelson (Graduate School of Oceanography, University of Rhode Island, Kingston, R.I. 02881)
Chesapeake Science 8, No. 3, 155-169 (September 1967)

Shoal environments are often very productive because of the interaction between the currents and the frictional drag over the bottom. This results in a narrow zone where filter feeders and other bottom dwellers obtain food and oxygen. The shoal environment is traversed by tidal currents so that the flow near the sediments is retarded by friction over the bottom and is relatively turbulent. The author measured the currents as retarded in this manner. Most of the sampling was done at the level of the flow, which was 1-3/4 centimeters off the bottom. The flow was about 0.4 as fast as the tidal current above, and this ratio persisted through a wide range of currents.

The epibenthic waters were compared with the overlying, free-flowing waters of the tidal currents with respect to the following parameters: temperature, salinity, and density; dissolved phosphate, nitrate, silicate, and oxygen; dry weight, ash weight, and ash-free weight of particulate matter; phytoplankton by species, presented by counts and by volumes and including microflagellates as a group; plankton pigments and plankton productivity as determined by oxygen changes in light and dark bottles. For every parameter measured, there were

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 ABSTRACTER: M. F. Tripple

9.13

OXYGEN CONSUMPTION OF RED AND WHITE MUSCLES FROM TUNA FISHES

Gordon, Malcolm S. (Department of Zoology, University of California, Los Angeles)
Science 159, No. 3810, 87-90 (January 5, 1968)

Physiological studies on tuna are made difficult by the large size of these fish and their extreme sensitivity to capture and handling. Only recently has adequate evidence been obtained for such basic phenomena as the physiological regulation of body temperature (endothermy) of several species of tuna. The purpose of the research reported in this paper is to contribute to the understanding of the metabolic basis for and the significance of this endothermy, and of the spectacularly high levels of continuous activity of these tuna fish.

The author measured the oxygen consumption of fresh, minced, unstimulated samples of red and white muscles from two common species of Pacific tunas, the skipjack (Katsuwonus [Euthynnus] pelamis) and the bigeye tuna (Thunnus obesus). Similar data for mammalian skeletal muscles containing both red and white fibers from the white rat are included for comparison. The metabolic rates of preparations of both red and white muscles from the two tuna were determined from respirometric measurements of oxygen consumption.

The ratios of mean metabolic rates for red muscles to the rates for white muscles averaged 6.2 at five temperatures ranging from 5° to 35° C. These temperature limits were chosen because 5° C. is as low a temperature as a tuna is

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 ABSTRACTER: M. F. Tripple

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periodic differences between the character of the epibenthos and the overlying waters. These differences were the result of a lag or delayed mixing of retarded flow into the epibenthic zone, but no persistent or cumulative differences developed. For some studies, it would be feasible to ignore this lag in mixing; however, to understand the utilization of plankton from the water column and to consider other processes where exchange rates and transitory accumulation effects are involved, it is important to realize that there is an ecological discontinuity between the epibenthic and the overlying waters.

The observations covered a 1-year period , during which time several correlations were found between the parameters measured in the tidal waters. These correlations are discussed. One of the most significant correlations ecologically is the positive correlation between the abundance of microflagellates and productivity. Apparently the microflagellates, rather than the larger plankton, are the major primary producers in estuarine waters. [14 references]

Vinetskaya, N. I.
Chemical Abstracts 66, No. 26, 118686u (June 26, 1967)

9.11 PHOSPHATE PHOSPHORUS AND ITS ACCUMULATION IN THE NORTHERN PART OF THE CASPIAN SEA

9.13

likely to encounter; 35° is only slightly higher than the highest temperatures measured in tuna muscles. The activity of red muscle was much higher than that of white muscle at all temperatures. The temperature coefficients (Q_{10}) for mean metabolic rates for both types of muscles were between 1.0 and 1.2 over the entire temperature range. Metabolic rates of red muscles from tuna were equal to the rates of preparations of mixed red and white muscle from the white rat at 25° and 35° C.; they were higher than the mammalian rates at lower temperatures. Metabolic rates of both types of tuna muscle were less sensitive to temperature change than the mammalian muscles were.

From the data obtained and from other observations, the author draws what he feels to be a reasonably coherent picture of the locomotory metabolic activities of tunas. The exceedingly high rate of oxidative metabolism in the red muscle provides the energy needed for both the high cruising speeds of tunas and for the maintenance of high temperatures in the muscles. The thermoregulatory abilities of the tunas assure that muscle temperatures remain high to supply a maximum energy supply for swimming. The temperature independence of red muscle metabolism between 25° and 35° C. assures that even large variations in absolute levels of thermoregulation will not seriously affect this supply of maximum energy. The low Q_{10} for red metabolism between 5° and 25° C. assures that fairly high rates of energy for normal swimming will continue even if the fish encounter such low water temperatures that they can no longer maintain high temperatures in the deep red muscles. [16 references]

9.1

attracted only small numbers of fish, the ratio of fish caught to sargassum examined being 2.1. Although no particular relation was noted in the field between the size of the floating seaweeds and the number of fish gathered around them, such a relation was evident under experimental conditions. [16 references]

II - Behavior and feeding habit.--Ibid. 930-936. To observe the relation between fish behavior and floating seaweed, the authors built an experimental raft of sargassum and studied the reactions of the fish both during the day and at night. They also examined the stomach contents of the fish and related them to the observed behavioral characteristics. Seven of the twenty-four species of fish observed always kept in contact with the raft, seven swam freely around the raft but did not get far from it, three floated around the raft belly side up, and four swam about under the raft only. The habits of the remaining species varied with the age of the fish.

The amounts of food found in the fish were compared with the index obtained from the formula: food amount index = (wet weight of stomach contents/body weight) $\times 10^3$. The rate of preference of a food item was determined by the formula: appearance frequency of a food item = Σ volumetric percentage of a food item in the stomach/number of individual items in the stomach.

Although the amount of food in the stomachs of the fish varied considerably from time to time during the day, no relation was found between the changes that occurred in any one day with those that occurred in another. When the food amount index (FAI) was low, numerous kinds of organisms appeared among the stomach contents; when it was high, one or two kinds of organisms predominated; copepods were usually abundant. Most of the fish seemed to depend on the seaweed for both food and shelter. [8 references]

9.125

the A band. A varying number of actin filaments is often visible on either side of the N band, which seems to be a region of well-developed cross connections or branching between the actin filaments.

Transverse tubules occur at the Z line. On either side of these tubules are large vesicles of the sarcoplasmic reticulum connected by ramifying cisternae. The cross section of the sarcoplasmic reticulum usually consists of single rows of vesicles between the fibrils, which are less broken in the region of the large vesicles opposite the I zone than opposite the A zone. At the triads, there is an accumulation of material in the sarcoplasmic reticulum, in the transverse tubule, and in the space between the membranes. Chains of round particles occur in the sarcoplasmic reticulum. These particles are easily distinguished from the fine filamentous material in the mitochondria and from particles in the sarcoplasm outside the sarcoplasmic reticulum because they are uniform in size and density.

The sarcolemma possesses the typical arrangement of a cell membrane and a basement membrane. Outside the sarcolemma are collagen and reticulin fibers that form a network between two opposing sarcolemmas. The sarcolemma has shallow and deep invaginations.

The nuclei and the mitochondria possess a typical structure. There appears to be a convoluted arrangement of the nuclear material immediately inside the nuclear membrane. Some mitochondria have orderly, closely packed cristae; other mitochondria have distended cristae. The round appearance of some cristae suggests that they are tubular. Mitochondria frequently are closely associated with the Z line band of several sarcomeres. Sometimes there are close associations between mitochondria and nuclei. [19 references]

PHOSPHATE PHOSPHORUS IN THE CASPIAN SEA

BEHAVIOR AND FEEDING HABITS OF FISH GATHERED AROUND SEAWEED

9.16 (*) WILL ATLANTIC LOBSTERS BREED IN B.C. WATERS?

Ghelardi, R. J., and C. T. Shoop (Fisheries Research Board of Canada Biological Station, Nanaimo, British Columbia)
Fisheries of Canada 20, No. 9, 7-12 (March 1968)

There have been numerous attempts to transplant the Atlantic lobster (Homarus americanus) to the Pacific coast; however, none of the attempts succeeded in establishing a reproducing population. The authors attempted a transplant of the Atlantic lobster with the expectation that they would be able to find out if and why such a transplant can or cannot be made. The failure of the previous lobster colonists was theoretically attributable to many causes, both simple and complex. The authors chose to begin by investigating three of the simplest causes: (1) something may have been wrong with the way the animals were handled; (2) the methods used for making the introduction may have been unsatisfactory; and (3) the places where the lobsters were transplanted may have been unsuitable.

The site selected as a location possessed some unique qualitites in that it was isolated, with a low frequency of human interference; oceanographic conditions were quite similar to those experienced by the lobsters in their natural habitat; and two restricted entrances reduced the opportunity for lobsters to leave unobserved.

The results obtained from the hatchery operation demonstrated that the physical conditions of temperature and salinity in the Pacific Ocean are satisfactory

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9.2 INDUSTRIAL FISHERY PRODUCTS

Anonymous
C.F.S. No. 4342, 9 pp. (1966) (Annual summary, revised) (U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, D.C. 20240)

The 1966 production of industrial fishery products by 159 plants in the United States, American Samoa, and Puerto Rico was valued at $73 million, which was a decrease of $9.9 million from the value for 1965.

The 1966 production of marine animal scrap and meal was 223,821 tons; this was 12 percent below the 254,051 tons produced in 1965. Production of menhaden scrap and meal decreased from 175,959 tons produced in 1965 to 134,954 tons in 1966. Imports of fish meal in 1966 amounted to a record 447,784 tons. The total supply of fish meal (domestic production plus imports) was 671,605 tons, which was slightly less than the record supply of 674,395 tons available in 1964.

Domestic production of marine animal oil amounted to 164 million pounds, which was a decrease of 31.4 million pounds as compared with the yield of 1965. Menhaden oil totaled 144.2 million pounds, which was a decrease of 31.0 million pounds from 1965. Exports of fish oils were 77.3 million pounds as compared with 103.8 million pounds in 1965. The 1966 production of fish solubles amounted to 83,441 tons; this figure was 11,399 tons, or 12 percent less than in 1965.

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9.17 (*) FISH DISCOURAGE WATER WEEDS

Anonymous
New Scientist 36, No. 566, 89 (October 12, 1967)

Floating algae and rooted plants are often a nuisance in lakes and ponds. Weed killers will remove these waterweeds, but the treatment may be expensive and the chemicals may either accumulate at the bottom of the ponds or create a shortage of oxygen that will suffocate fish. The decomposition of the dead plants may provide food for algae, which will then increase and defeat the purpose of the chemical treatment. Because of these shortcomings of chemical treatment, control of waterweeds by biological means is now being investigated. At the moment, introducing plant-eating fish looks the most promising.

This technique was recently investigated, using Tilapia mossambica, a species of fish that is pond reared in Africa and Asia as a food fish. Numbers of Tilapia were released into a 2.6-acre pond, which had a water temperature above 12.8° C., and contained a wide selection of waterweeds. Only Tilapia was added to the ponds initially, but in later experiments, largemouth bass, which prey on Tilapia and other aquatic animals, were also added. The first year, 58 Tilapia were added per acre of pond and by the end of the season the Tilapia had multiplied to 11,000 per acre. In the following 3 years, the stocking was done with about the same number of Tilapia plus various numbers of bass. Populations

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9.2 U.S. SUPPLY OF FILLETS AND STEAKS, 1958-66

Anonymous
C.F.S. No. 4343 (Annual summary), 5 pp. (Revised February 1968) (U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, D.C. 20240)

The production of fresh and frozen packaged fish fillets and steaks during 1966 in the contiguous states of United States was 165.9 million pounds, which was valued at $69.5 million to the processors. The number of pounds produced decreased by 2.9 million pounds as compared to the figures for 1965; however, the value increased by $3.2 million. It was estimated that 489.1 million pounds of round fish was needed for the 1966 production of packaged fish fillets and steaks.

This circular contains tables with the following titles: Production of fresh and frozen packaged fish by sections, 1966; Production of packaged fish by method of preparation, 1966; Summary of production of packaged fish, 1966; Summary and comparison of packaged fish, 1965-66; Production of fresh and frozen groundfish and Atlantic Ocean perch fillets, steaks, 1939-66; and Supply of groundfish and Atlantic Ocean perch fillets, 1948-66.

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BREEDING ATLANTIC LOBSTERS IN BRITISH COLUMBIA

CONTROLLING WATERWEEDS WITH FISH

PRODUCTION OF INDUSTRIAL FISHERY PRODUCTS, 1966

U.S. PRODUCTION OF PACKAGED FISHERY PRODUCTS, 1966

9.17

of Tilapia at the end of the season in these years were 11 per acre, 164 per acre, and 7,648 per acre.

The extent of waterweed in the pond was found to be related to the numbers of Tilapia present. In the years when the population of Tilapia was the largest, neither submerged rooted vegetation nor floating filamentous algae were seen after late June. In the years when Tilapia were few in number, the aquatic plants again became a nuisance. In the year with a moderate number of Tilapia, waterweeds were fairly abundant, though not as bad as in the previous year.

9.15 ACUTE TOXICITY OF SOME PESTICIDES TO FISH

Pickering, Quentin H., and Crosswell Henderson (U.S. Dept. of Health, Educ., and Welfare, Robert A. Taft Sanit. Eng. Center, Cincinnati, Ohio)
Chemical Abstracts 66, No. 13, 54544m (March 27, 1967)

9.15 HERBICIDES WHICH PRESENT A HAZARD FOR FISHERIES

Vejvoda, M. (Vyzkumny Ustav Rybarsky Hydrobiol., Vodnany, Czechoslovakia)
Chemical Abstracts 67, No. 11, 52939r (September 11, 1967)

9.16 (Cross Reference: 1.87)

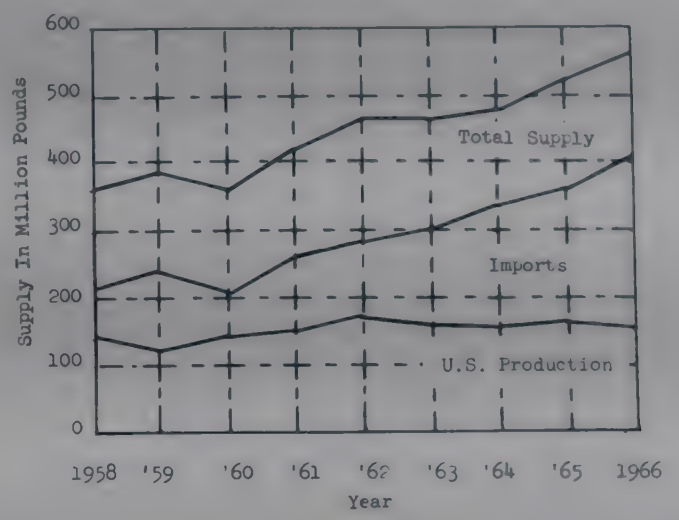
for normal embryonic development, hatching, larval survival, and growth. The hatchery also provided several thousand juvenile-stage lobsters, which were planted at another location to demonstrate the use of young, rather than adult, lobsters for a large transplant. Now that a reasonably large number of lobsters have been transplanted, the authors feel it will be possible to obtain more precise statistics on adult lobster survival, mortality, mating frequency, and fecundity, as well as hatching, larval survival, and growth in the Pacific habitat. These statistics will provide a basis for deciding whether it is possible and economically feasible to establish a reproducing population of east coast lobsters on the Pacific coast.

9.16 PRESERVATION OF FISH PITUITARY EXTRACT IN GLYCEROL FOR INDUCED BREEDING OF FISH

Ibrahim, K. H., and H. Chaudhuri (Central Inland Fisheries Res. Substation, Cuttack, India)
Chemical Abstracts 66, No. 13, 53302u (March 27, 1967)

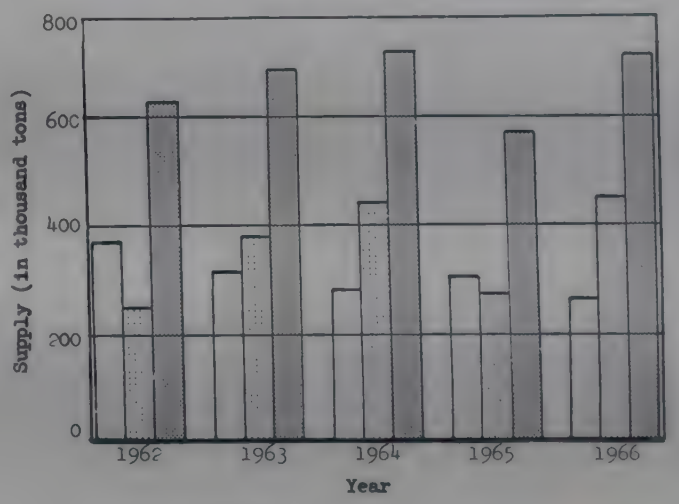
9.2

U.S. SUPPLY OF FILLETS AND STEAKS, 1958-1966



9.2

U. S. SUPPLY OF FISH MEAL AND SOLUBLES 1962-1966



Products made from oyster shells and buttons made from fresh-water and marine mollusk shells were valued at $5.1 million in 1966. This figure represented a decrease of $445,000 as compared with the preceding year. Other industrial items produced in 1966 included agar, fish feed pellets and animal feed, Irish moss extracts, kelp products, fish leather, fish fins, liquid fertilizer, colored chips, pearl essence, novelties, and crab shells. The total value of all these products was $17.9 million, as compared with a value of $20.8 million in 1965.

TOXICITY OF PESTICIDES TO FISH
HARMFUL HERBICIDES FOR FISH
PITUITARY EXTRACT FOR INDUCED FISH BREEDING

0.5 (*)

FURTHER INDICATIONS OF CLOSTRIDIUM BOTULINUM IN LATIN AMERICAN WATERS

Ward, B. Q., E. S. Garrett, and G. B. Reese (Bureau of Commercial Fisheries, Technology Laboratory, Pascagoula, Mississippi 39567)
Applied Microbiology 15, No. 6, 1509 (November 1967)

The presence of Clostridium botulinum in various types of fish and shellfish taken near the coasts of Venezuela and Columbia has been reported by Carroll et al. (1966). The geographic area covered by that limited survey has been enlarged by the examination of sediments from Brazil and of assorted animals from the waters of Nicaragua and Honduras.

Of the 82 animal specimens examined, only two of the batfish (Ogcocephalus sp.) specimens were contaminated by C. botulinum. Mouse protection tests showed that the C. botulinum was Type C.

Of 114 sediment samples, 7 were indicative of the presence of C. botulinum; one was Type C, one was Type A, two were Type B, and one was Type F. The results were in rough agreement with incidence figures reported for the upper Gulf of Mexico by Ward et al. (1967). However, mouse protection testing showed a pattern of types similar to that encountered by Carroll. In view of the large and increasing contributions of Mexican fisheries to U.S. markets, delineation of the possible limits of any hypothetical, more northerly, predominantly Type E zone; of a southerly, predominantly Types A to C zone; and of a transitional zone in Mexican waters could be of practical importance. [Abstracter: M. F. Tripple]

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0.7 (*)

THE INFLUENCE OF FEEDING PATTERNS ON NUTRIENT UTILIZATION

Proceedings of the Nutrition Society, 186th Scientific Meeting, Edinburgh, Scotland, February 24, 1967
Proceedings of the Nutrition Society 26, No. 2, 143-190 (1967)

This symposium on feeding patterns and nutrient utilization contains the following papers:

"Feeding patterns and nutrient utilization: Chairman's remarks"--D. P. Cuthbertson, pp. 143-144;

"Adaptation to the pattern of food intake: some mechanisms and consequences"--P. Fábry and T. Braun, pp. 144-152 [44 references];

"The time sequence of RNA and protein synthesis in cellular compartments following an acute dietary challenge with amino-acid mixtures"--W. H. Wunner, pp. 153-163 [23 references];

"Adaptation to overfeeding in man"--J. A. Strong and R. Passmore, p. 163;

"The effect of changes in feeding patterns on the performance of pigs"--R. Braude, pp. 163-181 [309 references]; and

"Effect of frequency of feeding upon food utilization by ruminants"--A. W. A. Burt and C. R. Dunton, pp. 181-190 [30 references]. [Abstracter: M. F. Tripple]

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0.5 (*)

EFFECT OF HEAT TREATMENT ON THE GERMINATION OF BACTERIAL ENDOSPORES

Kadota, Hajime, Yoshiko Shichi, and Yūzaburō Ishida (Research Institute for Food Science, Kyoto University, Kyoto, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 33, No. 8, 758-762 (August 1967)

Although some bacterial endospores may be activated by a heat treatment of about 80° C., the germination of other spores will be delayed by such treatment. To investigate some of the variables of this difference, the authors observed the germination of heated and unheated Bacillus subtilis harvested from various sporulating media and grown at various temperatures for varying amounts of time.

They found that the germination of freshly harvested spores was always inhibited by heat treatment, regardless of the composition of the sporulating and the germinating media or of the temperature of the treatment. However, spores that had been stored at 0° C. for more than 66 days were noticeably activated by a heat treatment of 80° C. for as short a time as 20 min. When the germinating media contained concentrations of L-alanine higher than 1 mM, spores that had been stored at 0° C. germinated more rapidly with than without heat. The conclusion drawn is that the effect of heat treatment on the germination of spores of Bacillus subtilis varies with the storage conditions of the spores. [Abstracter: L. Baldwin]

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1.85 (*)

SEASONAL RELATIVE ABUNDANCE AND SIZE DISTRIBUTION OF POSTLARVAL WHITE AND BROWN SHRIMP IN VERMILION AND COTE BLANCHE BAYS, LOUISIANA

Fontenot, Bennie Joseph, Jr. (Louisiana Wild Life and Fisheries Commission, New Orleans)
Master of Science Thesis, 77 pp. (1967) (University of Southwestern Louisiana, Lafayette, Louisiana 70501)

Postlarval white shrimp (Penaeus setiferus Linnaeus) and postlarval brown shrimp (P. aztecus Ives) were collected with a beam trawl at eight sampling stations in Vermilion Bay and Cote Blanche Bay, Louisiana, from March 1963 through September 1965. Brown shrimp were most abundant in March and April of each year; white shrimp, between July and September. Overall, the white shrimp were more abundant than the brown shrimp. The relative abundance of the shrimp was greater at stations nearer the Gulf of Mexico than at stations within the bays. Greater numbers of postlarval shrimp were caught in Western Vermilion Bay than in either Eastern Vermilion Bay or Cote Blanche Bay. [Abstracter: M. F. Tripple]

*Items on back of card.

1.88 NUTRITIVE VALUE OF MUSSELS OF THE BLACK SEA

Korobkina, G. S., E. N. Danilova, N. N. Kalinina, and T. A. Leonova
Chemical Abstracts 64, 14869d (May 9, 1966)

BACTERIOLOGY

BACTERIOLOGY

NUTRITION AND MEDICINE

SHRIMP
SHELLFISH AND CRUSTACEANS

0.5 STATUS OF BACTERIAL TOXINS AND THEIR NOMENCLATURE: NEED FOR DISCIPLINE AND CLARITY OF EXPRESSION

Bonventre, Peter F. (Department of Microbiology, University of Cincinnati, College of Medicine, Cincinnati, Ohio 45219), Ralph E. Lincoln, and Carl Lamanna
Bacteriological Review 31, No. 2, 95-109 (June 1967)

As increasing attention is directed toward the study of toxins and as biochemical sophistication increases the general awareness of the diversity and complexity of material that can legitimately be classified as toxins, the inadequacies and inconsistencies of the present nomenclatural system will become increasingly confusing. Recognizing a parallelism between the difficulties of toxin nomenclature and the problems faced by biochemists and enzymologists before the International Union of Biochemistry published its Enzyme Nomenclature in 1964, the authors have set themselves three specific goals: (1) to describe the nomenclature currently applied to bacterial toxins and to suggest ways of making the terminology clearer and more uniform; (2) to stimulate the scientific community to think about the problem, analyze it constructively, and ultimately to adopt a consistent terminology; and (3) to point out those areas where the older nomenclature, when used in the proper context, is of continuing value. [78 references]
[Abstracter: L. Baldwin]

1.86 HOPES GROW FOR COMMERCIAL QUEEN CRAB FISHERY

Gallant, Joseph G. (Eastern Fisheries Limited, Souris, Prince Edward Island, Canada)
Canadian Fisherman 54, No. 10, 21, 25 (October 1967)

The Queen crab (Chinoecetes opilio) is found from West Greenland to Maine and from Alaska to Siberia. On the Atlantic Coast, these crabs are considered a nuisance, and no effort has been made to exploit this species on a commercial basis. Interest in the Queen crab was generated in 1965, and a survey was made, which encouraged further work on fishing gear, method of holding aboard vessel, biological information, location and sizes of beds, and developing processing techniques. A possible Queen crab fishery could mean use of the wooden dragger fleet that is becoming obsolete in the groundfishery, additional employment for fishermen and plant employees, and increased diversification of fishery products.
[Abstracter: A. Reed]

0.5 BIOCHEMISTRY OF SOME FOODBORNE MICROBIAL TOXINS

Mateles, Richard I., and Gerald N. Wogan (Eds.)
Papers presented at a symposium on microbial toxins held during the meeting of the American Chemical Society, New York, September, 1966, 183 pp. (M.I.T. Press, Cambridge, Mass. [1967]) Price $7.50
Reviewed by J. R. Porter (Department of Microbiology, University of Iowa College of Medicine, Iowa City)
Science 158, No. 3797, 109 (October 6, 1967)

Ten papers presented at a symposium on microbial toxins held by the American Chemical Society have been assembled in this book. Discussions of the chemistry and toxicology of the toxic metabolites of bacteria, algae, and higher fungi; the medical potential of some of the derivatives of the toxins; and their significance as possible contaminants of animal and human food make the book useful to workers in nutrition, toxicology, biochemistry, microbiology, and food preservation.
[Abstracter: L. Baldwin]

0.7 FOOD HABITS AND NUTRITIONAL STATUS OF MINORITY GROUPS IN THE UNITED KINGDOM

187th Scientific Meeting, Royal Society of Medicine, London, March 17, 1967
Proceedings of the Nutrition Society 26, No. 2, 191-229 (1967)

This symposium on the food habits and nutritional status of minority groups in the United Kingdom contains the following papers:

"The nature and extent of minority groups in Britain"--J. H. Westergaard, pp. 191-197. [16 references];

"Social and economic implications of minority food habits"--J. C. McKenzie, pp. 197-205. [8 references];

"The nutritional status of vegans and vegetarians"--F. R. Ellis and Pamella Mumford, pp. 205-212. [39 references];

"Nutritional status of Asian infants"--M. A. Hussain and G. R. Wadsworth, pp. 212-218. [12 references];

"The nutritional status of West Indian immigrants"--Bruno Gans, pp. 218-222. [10 references]; and

"Response of the food industry to minority demands"--Harold Fore, pp. 222-229.
[Abstracter: M. F. Tripple]

2.1129 PVC FLOATS AND BUOYS
(*)
Anonymous
Norwegian Fishing and Maritime News 14, No. 2, 21 (1967)

A Norwegian firm is manufacturing plastic floats and buoys constructed mainly of polyvinyl chloride (PVC), which is strong, durable, and needs no maintenance. Because of these qualities, and because they are convenient to use, the floats and buoys are in constantly increasing demand in European countries and overseas.

The patented floats come in five sizes up to 70-80 in. and are of a special shape that was developed in cooperation with experienced fishermen. The mooring buoys are in three sizes up to 50-60 in. All the floats and buoys feature a speial nonprotruding valve and a strong, brass-sheath, thimble fastening that is molded into the body of the float or buoy to reduce wear and tear. The firm also produces plastic float rings in sizes from 7 x 1½ in. to 8 x 2 in. and net and trawl plastic balls in 6 sizes from 3 to 8 in. [Abstracter: M. F. Tripple]

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2.1476 HIGH GILLNET DROPOUT RATE CITED BY SEINERS
(*)
Anonymous
Western Fisheries 73, No. 3, 48-49 (December 1966)

Results of a study on salmon dropout from gill nets by the U.S. Bureau of Commercial Fisheries have been used by British Columbia salmon seiners to support their demands for more fishing time in more areas.

The study, conducted under good weather conditions with waves less than 2-3 feet in height and winds under 15 knots, involved the use of small boats to check the string of gill nets at night. The corkline directly over a gilled salmon was marked and the nets were examined in the morning for the presence or absence of netted fish. Patrols were made three times a night when possible.

Results showed that the dropout rate was 36 to 57 percent over a period of 8 to 10 hours. Patrols made after 2½ hr. indicated a dropout rate of 20.6 to 23.1 percent, and a check after ½ hr. showed a 3.8 percent loss. The scientists further noted that fish known to be in the nets at least 2½ hr. continued to drop out.

The British Columbia fishermen feel that the experiments proved that a high percentage of the fish they gilled are lost. A representative of the British Columbia fishermen noted that gill-net fishermen are forced to fish in far worse weather conditions than are those under which the experiments were conducted.

*Items on back of card. [Abstracter: E. R. Weissman]

2.12 OCCURRENCE, ABUNDANCE, AND SIZE DISTRIBUTION OF FISHES
(*) AND CRUSTACEANS COLLECTED WITH OTTER TRAWL
IN VERMILION BAY, LOUISIANA

Perret, William S. (Louisiana Wild Life and Fisheries Commission, New Orleans, La.)
Master of Science Thesis, 64 pp. (1966) (University of Southwestern Louisiana, Lafayette, Louisiana 70501)

Fishes and crustaceans were collected with a 16-ft. otter trawl with 3/4-in. bar mesh at three sampling stations in Vermilion Bay, Louisiana, from June 1964 through September 1965. The three sampling stations were Vermilion River Cutoff, Redfish Point, and Southwest Point. The total number of fish species collected was 43, and the total number of crustacean species collected was 5. The species collected, their frequency of occurrence, and their number were listed for each sampling station. The greatest number of fish species and the greatest number of individual fish were taken at the Southwest Point Station; the fewest species and fewest individuals at the Vermilion River Cutoff station. Sciaenidae occurred more frequently and in greater number in the trawl catches than did fish in other families. Atlantic croaker (Micropogon undulatus) occurred more frequently and in greater number than did any of the other fishes collected. All five species of crustaceans were taken at each sampling station. White shrimp (Penaeus fluviatilis) was the most abundant crustacean collected. Blue crab (Callinectes sapidua) occurred more frequently but was less abundant. The relative abundance and size distribution of selected fishes and crustaceans were determined.

*Item on back of card. [Abstracter: M. F. Tripple]

2.9 TETRODOTOXIN BLOCKS A GRADED SENSORY RESPONSE
(*) IN THE EYE OF LIMULUS

Benolken, R. M., and D. J. Russell (Zoology Department, University of Minnesota, Minneapolis)
Science 155, No. 3769, 1567-1577 (March 24, 1967)

The high concentrations of tetrodotoxin in puffer fish are more than adequate to cause fatalities. The generalization, however, that tetrodotoxin selectively blocks all or none of the electrical activity of nerve and muscle while having negligible effect on graded responses of sensory systems does not appear to be valid for the eye of the horseshoe crab, Limulus. Tetrodotoxin reversibly blocks the graded transient component of the visual response, whereas the steady-state component of the response is relatively unaffected by the drug. [10 references]

*Items on back of card. [Abstracter: M. M. Gwin]

2.9 UPTAKE AND RETENTION OF ^{32}P AND ^{65}Zn FROM THE CONSUMPTION OF COLUMBIA RIVER FISH

Honstead, John F., and David N. Brady (Battelle-Northwest, Richland, Washington)
Chemical Abstracts 66, No. 7, 26413z (February 13, 1967)

FISHING GEAR

EXPLORATORY FISHING

FISHING METHODS

TOXICITY OF FISH

2.12 PROGRESS IN EXPLORATORY FISHING AND GEAR RESEARCH IN REGION 2, FISCAL YEAR 1966

Bullis, Harvey R., Jr., and John R. Thompson (Exploratory Fishing Base, Bureau of Commercial Fisheries, Pascagoula, Mississippi 39567)
Circular 265, 14 pp. (September 1967) (U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 20240)

The highlights of the Bureau of Commercial Fisheries' Exploratory Fishing and Gear Research projects for 1966 in Region 2 are as follows:

1. The systematic exploration for fish and shellfish off the South Atlantic and in the Caribbean was continued.

2. Fish pump and nightlight fishing were tested in the Windward Islands.

3. The data from 16 years of research in the Gulf of Mexico were summarized and analyzed as a basis for scheduling research cruises.

4. Shrimp behavior was studied to aid fishermen in making a profitable harvest and to help researchers design components for an electroshrimp trawl.

5. Automatic Data Processing cards were used to record data from field explorations, hundreds of specimen identifications, records on surface school fishes, and data on gear research.

6. An atlas was completed that shows how commercially valuable concentrations of brown, white, and pink shrimp are distributed in the Gulf of Mexico.

[Abstracter: M. F. Tripple]

2.9 CIGUATOXIN: ISOLATION AND CHEMICAL NATURE

Scheuer, Paul J. (Department of Chemistry, University of Hawaii, Honolulu 96822), and Wataru Takahashi, Junzo Tsutsumi, and Tamao Yoshida (Hawaii Institute of Marine Biology, University of Hawaii, Honolulu)
Science 155, No. 3767, 1267-1268 (March 10, 1967)

Ciguatoxin is the agent that causes ciguatera, a disease produced in humans by ingestion of certain fishes. This toxin was isolated from specimens of the moray eel, Gymnothorax javanicus. Analysis of ciguatoxin showed that the toxin is apparently a lipid containing quaternary nitrogen, hydroxyl, and carbonyl functions. [14 references]

[Abstracter: M. M. Gwin]

2.118 FREEZING THE HAKE CATCH IN A SOUTH AFRICAN TRAWLER

Anonymous
Fishing News International 5, No. 7, 71-72 (July 1966)

The 150-foot, 576-ton Pionier IV, the first all-freezer stern trawler to be built for a South African fishing company, is described. Among the equipment installed for the first time in a South African trawler is a heading machine, which has enabled the owners to reduce the crew by four men.

[Abstracter: L. Baldwin]

2.145 A SOFT WAY TO PICK OYSTERS

Anonymous
New Scientist 34, No. 542, 207 (April 27, 1967)

A new method of mechanically picking oysters that prevents the oysters from being crushed under the wheels of tractors has been developed. This improvement was accomplished by fitting a 2-ton tractor with special low-pressure tires that prevent the compression that crushes oysters. The 4-foot, broad-print tires are made of soft natural rubber and spread the weight out over such a large area that the pressure on the ground is only 2 to 3 pounds per square inch.

[Abstracter: M. M. Gwin]

EXPLORATORY FISHING

FACTORYSHIPS

TOXICITY

FISHING METHODS
FISHING VESSELS

3.15 (*) STUDIES ON THE RADIATION PRESERVATION OF FISH. I - THE EFFECT ON CERTAIN VITAMINS IN FRESH FILLETS OF COD AND DOGFISH AND IN SMOKED FILLETS OF COD AND HERRING

Mameesh, M. S., Gj. Boge, H. Myklestad, and O. R. Braekkan
Fiskeridirektoratets Skrifter, Serie Teknologiske Undersøkelser 4, No. 10, 10 pp. (1964)
World Fisheries Abstracts 17, No. 1, 41-42 (January-March 1966)

The effect of radiation pasteurization at 0.3 Mrad and radiation sterilization at 3.0 Mrad on certain vitamins in canned fresh fillets of cod and dogfish and in vacuum-packed smoked cod and herring was studied. Also, the effect on the vitamin contents of storing the irradiated samples at various temperatures was determined. Some differences between the sensitivity of the various vitamins to irradiation and to storage were noted. Thiamine was most sensitive to both irradiation and storage; the nonirradiated samples lost thiamine during storage, whereas the irradiated samples lost little or none. Riboflavin was more sensitive to storage than to irradiation; whereas niacin and vitamin B_{12} were not appreciably affected by either. Vitamin A was more sensitive to radiation in the smoked than in the fresh fish--a sample of (fresh) dogfish retained 50 percent of its vitamin A content after being irradiated at 3.0 Mrad. Vitamin E was not affected by any of the radiation doses used during the investigation.
[Extractor: L. Baldwin]

*Items on back of card.

7.42 (*) ANNUAL FLUCTUATIONS OF SEVERAL INORGANIC ELEMENTS IN SHORT-NECKED CLAMS

Shimizu, Toshi (Sagami Women's University, Sagamihara, Kanagawa, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 33, No. 7, 686-689 (July 1967) (In English)

The annual fluctuation of seven inorganic elements was measured in the meat and the shell liquor of short-neck clams, Venerupis japonica. The clams were collected on a fixed day of every month from January 1962 through February 1963 and from August 1964 through August 1965. Cobalt, copper, and iron were measured colorimetrically; ß-nitroso-α-naphthol, dithizone, and o-phenanthroline, respectively, were used for these measurements. Calcium and magnesium were determined by chelate titration with ethylenediaminetetraacetic acid, and potassium and sodium were determined by flame photometry.

Results are given in five tables. Copper, iron, and sodium content fluctuated most widely. The ash content, which is closely related to the sum of calcium, magnesium, sodium, and potassium, peaked twice a year, in August and in December. These peaks seemed to appear several months after the clams had spawned.
*Item on back of card. [Abstracter: L. Baldwin]

7.42 SEQUENTIAL ANALYSIS OF RADIONUCLIDES IN MARINE ORGANISMS
Tsuruga, Hanato
Chemical Abstracts 66, No. 23, 102421t (June 5, 1967)
COMMERCIAL FISHERIES ABSTRACTS VOL. 21 NO. 8 PAGE 25
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

4.64 (*) TERTIARY-BUTYLHYDROQUINONE -- AN ANTIOXIDANT FOR FATS AND OILS AND FAT-CONTAINING FOODS

Sherwin, E. R. (Eastman Chemical Products, Inc., Subsidiary of Eastman Kodak Co.), and J. W. Thompson (Tennessee Eastman Co., Division of Eastman Kodak Co.)
Food Technology 21, No. 6, 106-110 (June 1967)

Mono-tertiary-butylhydroquinone (TBHQ) has good potential as an antioxidant for edible fats and oils. The data presented show the higher potency of TBHQ in highly unsaturated fats and oils as compared with currently available antioxidants, the absence of discoloration when TBHQ is used in the presence of iron, and the good solubility and other attractive physical properties of TBHQ that might facilitate its use. Preliminary data indicate that TBHQ has an order of toxicity similar to that of antioxidants presently approved for use in foods.
[10 references] [Abstracter: M. M. Gwin]

*Items on back of card.

4.64 COLORIMETRIC ESTIMATION OF THE ANTIOXIDIZING PROPERTIES OF TISSUE LIPIDS
Filippov, Yu. I., I. A. Korovina, and A. I. Zhuravlev
Chemical Abstracts 66, No. 23, 102393k (June 5, 1967)
COMMERCIAL FISHERIES ABSTRACTS VOL. 21 NO. 8 PAGE 25
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

9.2 (*) FROZEN SEAFOOD INDUSTRY SOARED PAST $ ONE BILLION IN 1966, A RECORD

Anonymous
Quick Frozen Foods 30, No. 2, 87-90 (September 1967)

Weights and values of some of the frozen seafoods sold in 1965 and 1966

Product	Weight (in pounds) 1965	1966	% change	Value (in dollars) 1965	1966	% change
Fillets	71,905,055	76,189,869	5.9	135,362,914	156,637,056	15.7
Fish sticks	82,483,000	81,295,000	-1.0	56,089,802	58,920,406	5.6
Fish portions	140,464,000	146,637,000	3.6	84,428,643	91,548,079	8.4
Shrimp	266,860,000	280,283,000	2.7	325,937,195	356,887,953	9.4
Breaded shrimp	98,144,000	104,040,000	6.0	102,706,409	134,525,439	30.9
Rock lobster tails	38,235,000	36,847,000	-3.6	96,506,360	90,422,294	-6.3
Scallops	21,363,000	21,483,428	0.6	26,567,026	20,228,771	-24.0
Crabmeat	9,551,633	12,302,317	28.7	21,614,940	21,590,567	-0.1
Langostinos	1,312,464	1,500,000	14.2	2,002,819	2,538,000	26.0
Clams	1,376,379	3,505,895	154.3	1,018,121	4,620,767	354.1
Oysters		4,483,125	39.0		5,866,755	39.0
Total	940,077,590	971,088,647	3.0	931,631,240	1,029,402,101	10.5
Handled by:						
Institutions	594,203,380	616,716,760	3.7	625,644,140	698,709,511	11.7
Retail trade	345,874,210	352,521,868	1.9	305,987,100	330,865,512	8.1

*Items on back of card. [Abstracter: L. Baldwin]

4.64 PRO- AND ANTIOXIDANTS IN THE FIELD OF FATS
XXI - PHENOLIC COMPOUNDS OF THE VEGETABLE ORIGIN

Kaufmann, H. P., and Abd El Wahab El Baya (Aus der Bundesanstalt für Fettforschung, Münster, Westphalia, Germany)
Fette-Seifen Anstrichmittel 69, No. 4, 236-238, 239-240 (April 1967)

Quercetin, dihydroquercetin, robinetin, rhamnetin, morin, fisetin, and rutin were studied for the relation of their antioxidative effect to their concentration in the metyl esters of linoleic acid, linseed oil fatty acids, soybean oil, and linseed oil. It was found that the flavenols acted as antioxidants, and this effect depended upon the concentration. The inversion effect due to an increase in concentration was not seen. The relation between the antioxidative effect and the chemical constitution of the flavenols is discussed. [10 references]
[Abstracter: M. F. Tripple]

4.62 THE STABILITY OF OILS AND FATTY ACIDS.
V - THE ANTAGONISTIC EFFECT OF THE TOCOPHEROLS TO NITROGENOUS ANTIOXIDANTS IN SHARK LIVER OIL

Chahine, M. H., and F. A. El-Shobaki (Natl. Res. Center, Cairo, Egypt)
Chemical Abstracts 67, No. 11, 52849m (September 11, 1967)

4.62 THE USE OF ANTIOXIDANTS IN THE STORAGE OF CODLIVER OIL

Pereplетchik, R. R., and T. A. Korduban
Chemical Abstracts, Macromolecular Sections 68, No. 8, 70415a (April 15, 1968)

3.15 IONIZING IRRADIATION OF SALT WATER FISH AND FISH PRODUCTS IN GERMANY

Wittfogel, H. (Staatl. Veter. Unters, Amt., Cuxhaven, Germany)
Chemical Abstracts 66, No. 17, 75006c (April 24, 1967)

3.15 DENATURATION OF ENZYMES BY THE DIRECT ACTION OF IONIZING RADIATION AND ENZYMICALLY ACTIVE COMPONENTS OF THE CRYSTALLINE CHYMOTRYPSINS

Henderson, Louis Edwin (Univ. of Colorado, Boulder, Colorado)
Chemical Abstracts 66, No. 11, 43864q (March 13, 1967)

3.15 IDENTIFICATION METHODS OF IRRADIATED FOODSTUFFS

Lafontaine, A., and L. Bugyaki (European At. Energy Comm., Brussels, Belgium)
Chemical Abstracts 66, No. 19, 84785h (May 9, 1967)

3.13 PRESERVATION OF FOODS WITH NITROUS OXIDE

U.S. Patent 3,335,014
Chemical Abstracts 67, No. 23, 107508g (December 4, 1967)

9.2 RECORD SALES, SECOND HIGHEST EARNINGS REPORTED BY PACKERS

Anonymous
Western Fisheries 74, No. 5, 26-27, 34-35 (August 1967)

Total sales for one of British Columbia's fish packing firms in fiscal year 1967 were $77.6 million, which was the highest on record; net profit of $1.6 million was second only to the net profit for 1959. The improvement in earnings of $816,406 was due to a combination of new production from herring meal and oil plants in Nova Scotia and Newfoundland, the above average salmon production in B.C., and the continued growth of the company's diversified operations in the United States. The total sales of $77,614,370 was $9.2 million, or 13.4 percent higher than for the previous year. The increase was attributed to the larger volume of production achieved in most of the operating areas, which resulted in larger sales in each of the three product categories--canned fish products, frozen fish products, and meal and oil. Fiscal year 1967 was the sixth consecutive year in which the sales revenue of the company increased.
[Abstracter: M. F. Tripple]

9.3 IMPORTANT NEW REGULATIONS FOR FOODSTUFFS COMING INTO EFFECT ON JANUARY 1, 1968

Kruse, F.
Food Science Abstracts 2, No. 4, Abstract No. 68/465, p. 162 (April 1968)

New foodstuffs regulations in Germany make it necessary to include the date of packing or (in the case of meat products, fish, fish products, or other seafoods) the time the foodstuffs can be stored. The new regulations also control the amounts of pesticide residues that may be present in the finished foodstuff.

7.53 A "MODIFIED GERBER METHOD" FOR RAPID DETERMINATION OF FAT CONTENTS IN FISH

Ankorion, J., Rom Moav (Department of Genetics, The Hebrew University, Jerusalem, Israel), and G. Wohlfarth (Fish Culture Research Station, Dor, Israel)
Bamidgeh 19, Nos. 2-3, 46-49 (June 1967)

An easy and rapid method for determining fat content was needed for an investigation of the genetics of fat content in carp. Existing methods were not rapid enough to enable hundreds of determinations to be made in a few days without resort to prohibitively costly equipment or to highly trained personnel. The method of fat determination developed for canned fish by Risley (1957) and the Gerber technique for fat determination in meat (Jacobs, 1951) were combined to give an alternative method in which the fat is hydrolyzed by a strong acid and then separated by centrifuge. The authors named the new procedure the "Modified Gerber Method."

The described method has the following advantages: the results are in agreement with those obtained from ether extraction; the maximum degree of resolution is in the order of 5 percent when relatively large quantities (5 g. or more) of fish are available; teams of 2 technicians can make from 100 to 150 determinations in 1 day; the equipment is relatively inexpensive and is simple to use; and, since fat percentage is read directly from the butyrometer scale, the need for computation is eliminated. [Abstracter: M. F. Tripple]

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